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THE

ELECTRICAL REVIEW.

VOL. LXXXII. MAY 10, 1918. No. 2,111.

ELECTRICAL REVIEW.

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MANUFACTURERS PREPARE FOR THE RECONSTRUCTION PERIOD.

As our readers are fully aware from our various articles on the subject, we have followed as closely as human and war-time limitations will allow the multitudinous, multifarious, and ever-extending investigations and conclusions of the Ministry of Reconstruction. We recognise that whatever may be the state of affairs at this moment, there will come a time when immense changes must necessarily be made within a comparatively brief period, changes the like of which we have never witnessed before, and probably never shall do again in our lifetime. The war changes that have taken place affecting the industrial and common life of the people have been spread over a period of nearly four years. We have tried to accommodate ourselves to them stage by stage as each new war development has rendered them necessary. It will be more difficult, and possibly dangerous, when we try to get back as quickly as possible to approximately normal conditions. We cannot leave things to take their chance, therefore we do not join in the occasional popular jibe at a Ministry of Reconstruction and its host of committees, for we recognise that there is room for men of vision and foresight in directing our investigations in order that we may be as fully prepared as we reasonably can be for an entirely altered state of things.

We believe that Dr. Addison has so far performed his task very satisfactorily. We say "so far," because we do not believe that it is his intention to remain in charge of these operations as a practical administrator of the projects that his many committees have advanced, or will yet produce. But at present he is in charge of a vast variety of deliberations which, taken as a whole, are destined to have a great influence upon the life of the nation, in all its parts, in the approaching years, and the manner in which he is performing his task is one for congratulation rather than for unfriendly hypercriticism. It were a thousand pities to concentrate upon winning the victory over Prussian militarism unless we are going to fit ourselves for assuring to the nation the minimum of hardship in the days when the world is free. Long suffering is bound to follow the war, but we may reduce it by taking appropriate action during the war—keeping industrial and national disorganisation at the minimum, and being ready for the new conditions immediately they arise.

Yet, while we have said all this, we do not for one moment pin our faith for the future entirely to the works of a Ministry of Reconstruction, nor do we put our whole trust in legislation which may ensue as the outcome of the investigations of innumerable committees. Paul, in the person of Dr. Addison, may plant, Apollos, in the shape of Parliament, may water, but it is Industry which will give the increase which shall assist us all in the critical days of Peace. We hope that we shall not be misunderstood when we say that we are disposed to attach greater value at the moment to the practical measures that our industries themselves are taking than we do to committee deliberations. The latter are essential, but the former are absolutely indispensable unless the reconstruction seed is to fall into quite impoverished soil; indeed, perhaps it would not be far wrong to say that the two efforts

are really very closely related, for what the manufacturers are doing in the way of reorganisation in readiness for progressive and extended industrial activity is the carrying into effect on their own initiative of some of the principles which, separately considered, have found favour in Government committees.

In referring last week to the findings of the Lord Balfour Committee we showed, as we have done again and again during the last few years, that Germany, by declaring war and making us self-dependent, afforded us such opportunities for revising our industrial arrangements and recovering manufacturing ground that we had previously thoughtlessly allowed to be taken from us by penetrative and other measures, as there was no prospect of our having otherwise. Many British manufacturers have availed themselves of the opportunity to the full, and British industry and trade, British workers, and British stability should feel the effects of it for many a year, if the advantage is not frittered away at the Peace Table. There is material available for a long practical series of articles or a valuable book, devoid altogether of padding, showing the altered aspect of industry to-day compared to four years ago. The plans prepared in manufacturing offices, the changed and changing character of the output of the works, and many other things, could be requisitioned to pay their own testimony, if one only had the time, the facility, and the permission to tell the whole story. Part of it was told in the presidential address to the I.M.E.A. last year, where we found achievements of electricity in new industry sufficient to make the heart rejoice. Another part of it is told in the statements of individual manufacturing companies connected with the electrical and allied engineering trades, and part in the reports on operations of co-operative associations. But we do not think that we have come across any chapter of such immediate practical value, and of such substantial character as that which was put before the shareholders of Messrs Vickers, Ltd., at their annual meeting, held at Sheffield on April 25th.

We have witnessed many a piece of practical industrial reconstruction work in the electrical world during the last four years in the doings of well-known manufacturers. The joint action of battery makers in one connection; the co-operative trade-getting policy adopted by a numbef of motor and switchgear makers in the Russian market; the consolidation arrangements of Dick-Kerr, Willans and Robinson, United Electric Car, and the Phœnix Dynamo Co., with one commercial organisation for the whole; the purchase of a controlling interest in Fraser & Chalmers, and sole interest in Chamberlain & Hookham, by the General Electric Co., Ltd., which has for years had its own extensive network of selling companies in most of the markets of the world—these are a few of the things that occur to us as we write, as events likely to have a considerable bearing in the altered conditions of home and world trade in the future. But most recently of all are we impressed by the far-reaching operations which are to take place in connection with the manifold and world-wide operations of Messrs. Vickers, and the projects of the British Westinghouse Co., in which they, too, are now directly interested. Mr. Vickers states that his company had long intended to build a large electrical manufactory outside Sheffield, but instead of doing so they have entered into an arrangement under which they are associated with the Metropolitan Carriage, Wagon & Finance Co. in the control of the British Westinghouse Under present-day and prospective conditions it would take a long time to get a new factory into working order, so the intention, apparently, is to take advantage of the war-time factory extension at Trafford Park instead of starting new operations at Sheffield, the changes at the latter place being limited to an increase in the policy of specialisation. The Vickers peace industry programme is, however, a far larger thing than this. At a certain factory where 7,000 machines now serve mainly to manufacture automatic guns, 1,700 machines will be turned over to the production of sewing machines, giving, it is expected, a very considerable output within a few months of the end of the war; some are already being made at their other works, and the demand is in excess of the supply. From automatic guns to sewing machines sounds something like from swords to ploughshares, but the process is typical of many a coming change in our works. Mr. Vickers, like some other people, obviously cannot see the end of all war until human nature is changed, for he is not proposing to swing right over to peace manufacturing without giving a thought to other possibilities. It may interest Dr. Walter Rathenau, who once spoke so buoyantly about preparations for the next war, to note that Mr. Vickers advocates that a large part of the present war plant in their factories, which will be unusable for ordinary purposes, should be taken up and stored in one of their big buildings "ready for use in case Germany attacked us again." At another works, in the South, Messrs. Vickers propose to manufacture on a large scale certain semi-electrical devices for motor cars which are thought to have a wide application; also speed-controlling apparatus developed for war, but adaptable for marine work; and at the same place there will be made certain types of machine tools of a class hitherto mainly imported. Further, at a factory on the Thames a wood-working organisation is being established which apparently originated in a method of utilising waste products from war work, but which presents possibilities of profitable expansion. Magnetos will be manufactured on a large scale, and the new light alloy "Duralumin," at Birmingham. The older Vickers trades at Sheffield are also the subject of an ambitious programme, and at Barrow we shall witness greatly increased activity in mercantile shipbuilding, while the manufacture of land boilers and large gas engines also will be proceeded with there, the company having its eyes open to work that is likely to be required for the large electric power supply schemes that are practically certain to come along.

We believe that this summary of one great concern's intentions and operations in preparation for peace-time industry will impress our readers as it does us. We have no doubt that other big manufacturers connected with the electrical and engineering, and iron and steel trades, have ambitious programmes awaiting execution. Perhaps they, too, will divulge them in course of time. Little help can go to the enemy from thus disclosing intentions; nobody knows better than he what he has to come up against; on the other hand, it would make for our encouragement at home, and for safety by preventing unnecessary overlapping, if British manufacturers were able to know a little of what other firms had in mind. That is not possible if we are going to continue unrestricted competition between ourselves at home; it *is* possible if we act in co-operation, and try to co-ordinate our efforts.

We quote Mr. Douglas Vickers's speech with this prominence because the plans outlined afford an excellent example of practical work which can be, and is being, done *by industry itself* in preparation for the period of reconstruction.

Whitley Reconstruction.

Once more we desire to bring before industrial readers the desirability of taking steps to set up for the industries which we represent industrial councils along the lines laid down in the several Whitley reports. We understand that many such councils are now in process of formation, but in certain industries, for a variety of reasons, progress has been slow. In such cases, pending the

formation of Industrial Councils, it is important that there should be established Interim Industrial Reconstruction Committees consisting of equal numbers of representatives of organisations of employers and trade unions. Perhaps we know less now than at any previous stage of the war when it is going to end, but we may be able to avoid much serious trouble if we try in time to take such steps as these in order to smooth the way for the transition from war to peace conditions. Such interim committees can consider such matters as the promotion of industrial organisation, demobilisation and employment, raw materials for manufacturing industries, priority in respect of such materials, financial facilities for converting works from war work to normal production, and the development of new industries, which, as we have recently indicated, is being investigated by the Engineering (New Trades) Committee. The matter is set forth in useful detail in a new memorandum issued by the Ministry of Reconstruction, to which we would direct our readers' attention. The following is a specimen draft of an Interim Committee:—

1. The Interim Industrial Reconstruction Committee for the ..... Industry promoted by the Minister of Reconstruction, the President of the Board of Trade, and the Minister of Labour will consist of equal numbers of representatives of Associations of Employers and Trade Unions.
2. The Committee shall elect a chairman either from amongst its own members or from outside. In cases where no agreement can be come to with regard to a chairman, the Minister of Reconstruction will, at the request of the Committee, appoint a chairman.
3. The Committee shall take steps to provide itself with a secretary, and a place of meeting, but during the preliminary stages may, if desired, meet at the Ministry of Reconstruction, who will provide temporary secretarial assistance if desired.
4. The functions of the Committee shall be those set out in the Memorandum circulated with the letter of invitation.
5. At least one week's notice shall be given of meetings which shall be called by the chairman or by the secretary at his request.
6. The Committee will cease to exist on the formation of a Joint Standing Industrial Council on the lines recommended by the "Whitley" Committee.

As we have already explained, these Interim Committees will serve as an intermediate stage in industrial organisation in the case of industries wherein the degree of organisation is insufficient to admit of the immediate formation of a full Whitley Council. They will be a kind of stepping-stone whereon industries or trades may rest for a moment to consider the more urgent of the problems of reconstruction. It will be a great mistake to leave such matters to take care of themselves, or to wait for the Ministry itself to take definite action, though it has already approached a number of trades with successful results. The movement would proceed with greater expedition if our industrial readers would think the matter over for themselves and work out the necessary preliminaries.

British Manufacturers in Australia.

We wish to direct attention to the report of the annual meeting of the Australian Association of British Manufacturers and their Representatives which appears on another page of this issue. We believe that the very comprehensive speech of the chairman, Mr. M. C. Coates, will be read with interest by all at home who are watching the efforts of those who, under exceptional difficulties, are doing their utmost to keep the British trade-flag flying. The import figures for the year 1917 show what is happening, and we do well to assist our kith and kin out there who desire to regain the lost ground immediately the war pressure on the home factories is reduced. The Association showed a remarkable growth during the year, and we pass on to British firms not already on the roll the appeal that they should throw in their lot with those who reasonably expect to find in unity a great strength for the days to come.

Electricity in Ship Propulsion.

Elsewhere in this issue we give an abstract of a paper on the electrical equipment of the new U.S. battleship *New Mexico*; this, the largest unit in the U.S. Navy, will be propelled entirely by electric motors, fed from turbo-generators of 37,000 h.p., and all the auxiliaries will also be electrically driven. Not only will the machinery be lighter and cheaper than either mechanically geared turbines or reciprocating engines—it will also be more efficient, as shown in our abstract, the steam consumption being guaranteed under heavy penalties. This startling step in advance is largely based upon the success of the U.S.S. *Jupiter*, which was equipped with electrical propulsion expressly as an experiment; it bears witness to the complete confidence of the U.S. naval authorities in the reliability and economy of the electric drive, for no one would venture to make doubtful experiments with a 32,000-ton battleship, least of all in time of war. We hardly need add that we share that confidence. In point of fact, there is nothing experimental in the whole equipment. Turbo-generators, motors, and controlling gear have all been fully tried out in stationary service, and there is no reason whatever to suppose that they will prove wanting at sea, provided that due regard is had to the working conditions that obtain on board ship.

Our only regret is that the British Admiralty (so far as we know) has not yet seriously contemplated a similar forward step. Before the outbreak of war one or two cruisers had been fitted with electrically-driven auxiliaries, including the operation of the big guns, but the innovation was too daring for the conservative minds of the older men, who didn't hold with such new-fangled notions, and took the first opportunity to revert to hydraulic gear. We are reminded of the days when the electric telegraph was offered to the Admiralty, but rejected on the ground that the semaphore system fully met all requirements; as in that case, so in the present, the decision bore no relation to the merits of the apparatus, which was simply sacrificed to service traditions. As to what has been done since the outbreak of war, we have no information; all that we can positively affirm is that, also in accordance with tradition, our glorious Navy has preserved our shores inviolate, and done its duty under all circumstances with an heroic disregard of danger for which language provides no adequate eulogy.

It was, however, in this country that the electrical propulsion of ships first received serious attention; the late Mr. Henry Mavor's name cannot be here omitted, and the inventions of Mr. (now Lieutenant) Durtnall, who claims that his system was adopted on the *Jupiter*, must also be recognised. While, unfortunately, these pioneers were not fated to achieve the goal of their ambition, we are glad to know that their work has borne fruit, for we were privileged last week to inspect the machinery of a steamship of 6,000 tons, whose propeller is driven by electric power derived from two turbo-generators. This, we believe, is the first British sea-going steamer to be so propelled; and we congratulate the British Ljungström Marine Turbine Co., the contractors, as well as the Brush Electrical Engineering Co., the manufacturers of most of the plant, on their achievement, which we hope is only the first of many, and will have a long and prosperous career. The turbine, which is without doubt the most interesting type of turbine that has been developed, has given a good account of itself in many British power stations, and there is no reason to doubt that the new departure will prove wholly successful in respect of economy, reliability, and cost.

INCOME-TAX: WEAR AND TEAR AND OBSOLESCENCE ALLOWANCES.

By JOS. J. H. STANSFIELD.

A MEMORANDUM has just been issued by the Board of Inland Revenue on the subject of allowances for wear and tear and obsolescence of plant and machinery, a subject which is of importance having regard to conditions brought about by the war and the increase in the rates chargeable for income-tax.

Sec. 12 of the Customs and Inland Revenue Act, 1878, authorises a deduction in assessing the profits of any trade, manufacture or concern in the nature of trade chargeable under Sec. "D," or by reference to the Rules of that Schedule, of such an amount as the Income-Tax Commissioners "may think just and reasonable as representing the diminished value by reason of wear and tear during the year of any machinery or plant used for the purposes of the concern." In addition to this deduction an allowance is made in respect of the cost of repairs, but any claims under this Section must be made within 12 calendar months after the expiration of the year of assessment.

Sec. 26 of the Finance Act, 1907, provides that claims made for deductions for wear and tear to be allowed by the additional Commissioners shall be included in the annual statement of the profits or gains required to be delivered under the Income-Tax Acts.

There is no statutory limit to the amount which may be allowed, but the aggregate amount of the deductions must not exceed the actual cost, including in that actual cost any expenditure in the nature of capital expenditure by way of renewal, improvement, or reinstatement.

Where full effect cannot be given to the deduction for wear and tear in any year owing to there being no profits or to the profits being less than the deduction; the deduction to which effect has not been given shall be added to the deduction for or allowed from the profits of the following year, and so on for succeeding years until the deduction has been fully made.

Definite rates of depreciation on different classes of machinery have been agreed upon in a number of important industries, and it is stated that these allowances are now accepted by taxpayers and generally adopted. A list of these rates is given in the Memorandum, the following being of interest to those engaged in the electrical industry:—

Electric Light Undertakings.—3 per cent. on written down value of cables and 5 per cent. on plant and machinery.

Gas Undertakings.—Other than those owned by municipal or other public authorities 3 per cent. on gasholders and 10 per cent. on meters, cookers, and gas fires.

Motor-Omnibuses.—20 per cent. on written down value, but the rate is to be reconsidered at the expiration of four years, commencing with 1916-17. This rate does not apply to commercial motor vehicles.

Railway Wagons.—5 per cent.; this applies to all wagons owned by traders; but, in the case of railway companies, the method adopted is to allow the actual cost of renewals year by year.

Tramways.—Permanent way, an allowance per mile of track based upon the estimated life; 3 per cent. on cables, 7 per cent. on cars and other rolling stock, and 5 per cent. on renewal of plant and machinery, including standard brackets and workshop tools.

With the exception of the rates relating to omnibuses, all the above rates were fixed under pre-war conditions; but cases have arisen during the war in which machinery is suffering exceptional wear and tear owing, for example, to extra hours of running, the difficulty of obtaining material for effecting repairs, rougher usage through the employment of unskilled labour, or fewer opportunities of overhauling.

In such cases applications for special rates are entertained, but the circumstances of the individual vary so widely that a uniform scale cannot be fixed, each one being dealt with on its merits.

In addition to the allowances above mentioned, there has been in operation since 1897 an allowance for obsolescence (see letter of the Chancellor of the Exchequer of May 28th, 1897, to the Association of Chambers of Commerce). When new or improved machinery is introduced in place of machinery not wholly worn out, the Board of Inland Revenue agrees to allow so much of the cost of replacement as is equivalent to the written-down value of the machinery replaced, less any sum realised by the sale of it, the balance of the cost of the new machinery being treated as an addition to capital. This allowance is not, in practice, made unless there is replacement, it being considered that otherwise the loss is a loss of capital, and, therefore, not allowable.

As an alternative to the allowance for wear and tear and obsolescence, the cost of renewal may be claimed, and when this is preferred the amount to be allowed is the actual cost of the new plant and machinery (excluding any part of such cost which is attributable to additions or improvements *i.e.*, to increase in capital) after deducting the scrap value or realised price of the plant and machinery replaced.

Buildings and wasting assets are not allowed for, but the full cost of maintaining trade premises in proper working order is allowed in computing profits for assessment.

In controlled concerns under the Munitions of War Act, 1915, the income-tax allowance has been temporarily extended by the Finance Acts, 1916-17, to include exceptional depreciation or obsolescence of buildings, plant, or machinery, which are allowed for Excess Profits Duty and Munitions Levy purposes. This allowance is to prevent the hardship that would otherwise arise owing to the circumstance that controlled establishments being held at the disposal of the Government may be required to alter completely the course of their business, and to undertake exceptional expenditure which may be of little or no post-war utility to them.

Sec. 39 of the Finance Act, 1916, and Sec. 16 of the Finance Act, 1917, authorise the Commissioners to revise the income-tax allowance, so as to enable a deduction to be made from profits of the difference between cost and post-war value of installations and extensions (including buildings) which would not have been undertaken but for the war and the express requirements of the Government.

The Board of Inland Revenue is open to consider allowances in respect to excess profits duty for deferred repairs though a definite scale has not been laid down. The method adopted is to take current expenditure on repairs, and allow the difference between previous expenditure, with an additional sum for increased cost.

LARGE BATTERIES FOR POWER PURPOSES.

By E. C. McKINNON, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers.)

(*Concluded from page* 414.)

Maintenance agreements in the past have been to a certain extent a cause of irritation and dissatisfaction mainly because there has been no generally accepted standard, and many engineers have regarded the agreement as an insurance to cover all ill-treatment, in addition to the essential object which is the maintenance of the battery in good working order. If a recognised standard maintenance agreement approved by this Institution were available, negotiations would be greatly simplified.

There has so far been very little experience with batteries working at a line pressure higher than 600 volts in this country. When the Lancashire and Yorkshire Railway decided to employ direct current at 1,200 volts for the electrification of the Manchester-Bury section of their system—a length of 9½ miles—it was necessary to go abroad to study similar schemes. The most instructive—from the battery section—was the electric railway between Stockholm and Saltsjöbaden, a distance of 9½ miles. There the system is a direct-current one at 1,200 volts with overhead conductors, and includes a buffer battery of 650 cells with a rated output of 666 ampere-hours in one hour, which represents 800 KW. at the one-hour rate. The battery is employed for the double purpose of levelling up the line load variations in conjunction with a reversible booster, and also as a capacity battery for lighting and power purposes. The dry Swedish climate tends to simplify the question of insulation. The cells are of the ordinary central-station type, the only difference being the

doubling of the insulators. The gangways are mounted on high-tension insulators; the walls and columns of the battery room are screened with a lattice-wood structure mounted on insulated brackets; the lamps are hung out of reach; and the battery inspection lamps are fitted in special ebonite carriers and connected by flexible conductors in a "cab-tyre" sheathing. The battery is sub-divided into several sections by means of link connectors. The battery is on two floors, the lower one being treated as an ordinary 600-volt traction battery room, and the upper one being regarded as a high-tension chamber securely locked. Special instructions are issued regarding operations in the high-tension room.

There are two battery sub-stations on the L. & Y. Railway. Each battery consists of 580 T.P.W. 5/8 Plantide cells supplied by the Chloride Electrical Storage Co., Ltd. Each battery is divided into a low-tension and a high-tension section, *i.e.*, equivalent to two batteries placed in series. The low-tension section is constructed as an ordinary 600-volt traction battery, whilst the high-tension section is dealt with on very similar lines to those described in the Swedish system. The working of the batteries is normally controlled by Entz automatic reversible boosters.

A description of most of the notably large batteries in this country has been given in the electrical Press, or in papers read before the Institution. In all the batteries the positive plates are built on the Planté principle.

The battery at the Eagle Street sub-station of the Metropolitan Electric Supply Co. may be regarded as the acme to date of the special Planté type, while the batteries at Manchester, Bradford, Birmingham, and Wolverhampton represent the latest practice in true Planté batteries. The Eagle Street* battery comprises 110 "Chloride" cells, C.V.W. 26 type, but the sub-station is designed with the intention of duplicating the battery at some future date. The total weight of the battery is about 300 tons, and it is capable of discharging at 8,000 amperes for 35 minutes, or 15,000 amperes momentarily.

A Planté plate must be given fairly constant work or its condition will deteriorate. The Faure or pasted plate, on the other hand, will endure long periods of idleness without suffering any permanent after-effects. By a fortunate coincidence it is possible to obtain far more capacity for unit weight and cubic contents from a Faure cell than from a Planté cell. A cell of the Faure type is therefore eminently suitable for stand-by purposes. Its durability is inferior to that of Planté cells, but as it is possible to obtain 300 to 500 discharges from one set of plates this should amply cover emergency requirements for a period of 10 years.

The Exide negative plate is not unknown in central-station work in this country, as one set operated in daily use for 8½ years (1905 to 1913) in the large battery at the Fisher Street sub-station of the Metropolitan Electric Supply Co. For extensive practical results we must, however, still refer to the United States.

The largest stand-by battery installed in the United States up to the time the data were collected for this paper was at Detroit (Mich.). The maximum peak load during the winter of 1915-1916 occurred at 5 p.m. on December 17th, 1915, and amounted to 55,700 amperes at about 134 volts on each side

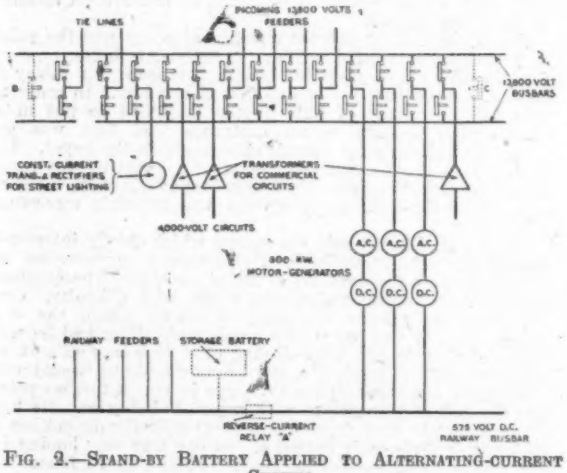

FIG. 2.—STAND-BY BATTERY APPLIED TO ALTERNATING-CURRENT SYSTEM.

of the three-wire system. The combined capacity of the four batteries installed will carry this load for 14 minutes. One battery alone consists of 150 "Exide" cells, type H. 169, installed in 1915, with a capacity of 25,200 amperes at 110 volts for one hour, or 80,000 amperes for 10 minutes.

Normally a stand-by battery floats on the supply system, regulating momentary fluctuations and in readiness for peak and emergency discharging, the adjustment being such that during the floating period the total amount of charge compensates for the discharge. The battery should be floated so that the pressure per cell in circuit will be between 2.10 and 2.14 volts, averaging as near as practicable 2.12 volts. Adjustment is made by cutting in or out end cells.

The installation of a storage battery for stand-by service on an alternating-current circuit presents no insurmountable engineering difficulties, and an interesting example of such an application is found at the Newton sub-station of the Edison Electric Illuminating Co., of Boston (Mass.). Power is received at 13,800 volts, three-phase, 60 periods, over duplicate transmission lines, a distance of 12 miles. The sub-station supplies three classes of service, viz.:—The local commercial load of lighting and power supplied to the distribution feeders at 2,300/4,000 volts, four-wire, three-phase; series arc lamps for street lighting; direct-current at 575 volts for operating the suburban electric railway in the district.

The original arrangement of the apparatus in this sub-station is shown in fig. 2 in full lines, while the apparatus added in connection with the battery installation is shown in dotted lines. The diagram is conventional, and shows only one phase of the three-phase circuits, and one side of the direct-current railway circuit. Duplicate high-tension bus-bars are provided, and duplicate oil switches for each incoming and outgoing circuit permit each circuit to be connected at will to either set of bus-bars. Step-down transformers furnish the 2,300/4,000-volt current for the local commercial load. Constant-current "tub" transformers with mercury-arc rectifiers are used for the street lighting, and three 50-KW. motor-generator sets furnish the 575-volt direct current to the railway bus-bars. Each of these units consists of a 13,800-volt synchronous motor direct-connected to a 575-volt interpole direct-current generator.

An "Exide" battery consisting of 344 cells, type H. 31, having a capacity of 2,250 amperes for one hour, or 4,650 amperes for 20 minutes, has been installed. During normal operation the battery floats directly across the railway bus-bars, which are maintained at a substantially constant voltage, so that the battery is doing no work. In case of any trouble on the high-tension distribution system of sufficient

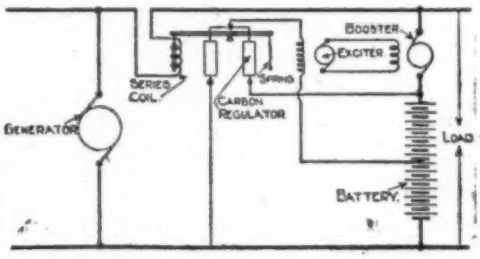

FIG. 3.—DIAGRAM OF CONNECTIONS FOR ENTZ CONTROL.

magnitude, the battery takes up all of the railway load and feeds back through motor-generator sets into the local alternating-current circuit, but not into the entire high-tension distribution system.

In order to ensure constant voltage during emergency discharges, the battery is provided with motor-operated end-cell switches automatically controlled by a contact-making voltmeter connected across the battery terminals.

Large batteries in this country all show results which prove that the practicability of very large batteries is assured.

The principles on which large batteries are controlled have not changed materially during recent years, but the policy adopted in practice has undergone an appreciable change. It remains a recognised fact that without some means of variable voltage regulation the amount of useful work to be obtained from the battery is very limited. To effect this regulation the choice lies between end-cell switches and boosters. Continental practice is solidly in favour of end-cell regulation. Until five years ago American practice favoured automatic boosters for almost all purposes, but now the trend in the United States is to employ motor-driven end-cell switches where the battery is used for lighting service (on peak work or for stand-by service), and automatic reversible boosters only where the control is required for rapid momentary fluctuations.

In this country boosters have so far formed the predominant method of controlling large batteries, despite the strong aversion on the part of some British manufacturers to build these special machines. There is undoubtedly much to be said in favour of booster control for even the largest batteries which have so far been installed in this country.

The Entz booster still holds a strong claim for superiority in all classes of heavy load regulation. Fig. 3 shows diagrammatically the connections for the Entz booster control.

The battery is connected across the feeder bus-bars and in series with the generator armature of a motor-generator or booster set. The booster has its fields energised by an exciter, the field of this exciter being varied in a positive or negative direction by current from carbon piles connected to either end of the battery. These piles are depressed through the action of a coil in the main generator circuit opposed by a spring, as indicated in the diagram. When the load is at the average, the coil and spring neutralise each other's action, and the carbon piles have an equal amount of current in

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* See ELEC. REV., April 21st, 1916.—EDS.

them. When the load fluctuates above the average, tending to call for more current from the generator, this increase of current in the coil overpowers the spring and the carbons on one side are compressed, energising the booster field in a direction to add to the voltage of the battery, thus causing it to discharge. On this discharge the battery voltage drops due to its internal resistance and polarisation, and the carbon regulator, being extremely sensitive, so adjusts the booster voltage that the battery discharge plus the average load equals the outside load. On fluctuations below the average the load on the generator tends to drop and the spring overcomes the coil, the battery receiving a charge equal to the difference between the average and the outside load. The Entz system has been applied successfully to alternating-current regulation as well as on direct-current service.

The cell switch is a vital part of the stand-by battery installation. Its importance can hardly be overestimated. Unless this part of the installation is absolutely reliable and capable of handling the battery output under all conditions the value of the battery as an emergency reserve is seriously impaired. The continuous rating of the end-cell switches should correspond to the one-hour rating of the battery. The overload capacity of the switches is then sufficient to handle any output which the battery can furnish. It is usual practice to install two or even three cell switches on each side of a three-wire battery.

The British-made end-cell switch as supplied by Messrs. Bertram Thomas is a remote-controlled regulator fitted with a lead-saving device shown diagrammatically in fig. 4. The switch arms A A are moved simultaneously by the motor B, which is started and stopped by a combined switch and indicator. By moving the switch handle E on to one of the two contacts F and G the coils of one of the two small contactors are energised, and this operates one of the direction

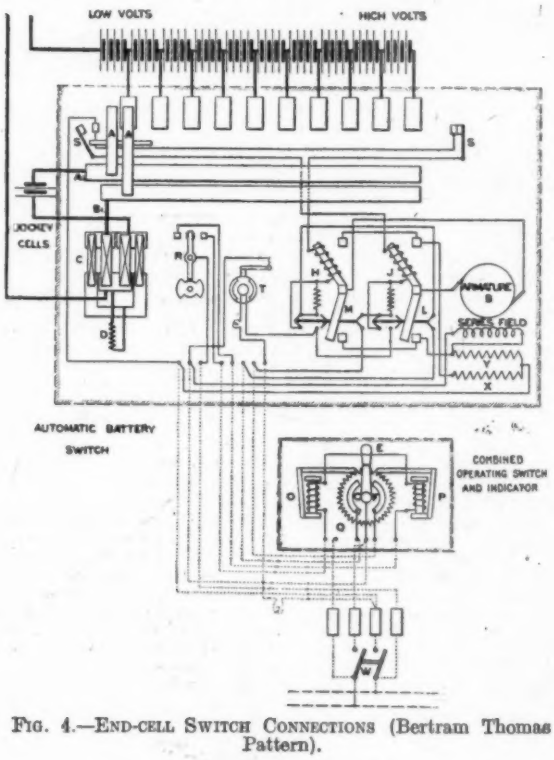

Fig. 4.—End-cell Switch Connections (Bertram Thomas Pattern).

switches L and M, thus energising the motor in the necessary direction to drive the battery switch to cut cells in or out. During the movement of the switch arms A A the four circuit breakers C are operated by cams, so that during the travel from one contact to the next the auxiliary or jockey cells are brought into operation, as also the pilot resistance D which is introduced to prevent short-circuiting of cells.

All making and breaking of circuit and changing from one cell to the next takes place on the four circuit breakers C. The two racking contactors O and P on the combined switch and indicator operate on a ratchet wheel Q. The coils of these two contactors are energised by the auxiliary switch R, which is in turn operated by the battery regulator, and makes contact in one or the other direction with each complete step traversed by the battery regulator. On each occasion the switch R makes contact it energises one of the contactors O or P, and this in turn racks the centre wheel of the indicator round which carries the contacts F and G. The battery switch continues to travel, and the contactor repeats the racking motion until the gap in the contacts comes opposite the handle E, at which point the battery regulator stops. When once an operation has been initiated by the operating switch E, the direction switch L or M, as the case may be, is held closed until the completion of a step by means of the auxiliary switch marked T, which is mounted on the regulator shaft, and energises the contactor of the direction switch independently of the operation switch as long as the regulator is between two steps.

Many of the batteries originally installed in American stations for daily peak work are now merely held in reserve for emergency service. This has led in some cases to the battery being discarded when the existing set of plates has worn out, but in most other cases the batteries have been renewed with plates of stand-by pattern; in fact this practice has become quite general in large central-station batteries for lighting service.

Discussion at Leeds.

The paper was discussed at a meeting of the Yorkshire Local Section at Leeds on February 12th, 1918.

Mr. R. H. Campion (Dewsbury) remarked that the question whether a battery should be installed or not on continuous-current systems often hinged on considerations other than the first capital cost, and the load was taken by the battery, but he did not think that it was possible to do this now in any fairly large station. The big batteries installed in England were not capable of taking the whole load for even a period of five minutes. Therefore there came a time when either the maintenance contract or the battery required renewal, and when the question arose as to whether it paid to have a battery. If one was to be guided by the 10 obstructing factors set forth by the author he was afraid that in most cases batteries would not be installed. A sphere in which batteries were useful and profitable was that of taking the peak loads of traction work, and if it were not for the reversible booster they would have to be stricter with the agreed-upon maximum demand that was taken. They must leave the question of standardisation to the makers, and he thought this should be easier now owing to the recent amalgamation of battery makers. With regard to specifications, he considered that it would be a great advantage to standardise and revise them every three years.

Mr. T. Roles said they had a very large battery in use at Bradford which, from all he had heard, was operating successfully. With regard to the obstructing factors to the use of batteries in this country mentioned by Mr. McKinnon, he must say that personally he had that "irreconcilable prejudice." Concerning the difficulty of providing the necessary capital, it needed a wealthy corporation to even consider the installation of a battery. The Local Government Board decreed that the capital expended had to be repaid during a period of seven years. The battery makers guaranteed a battery for 15 years, so that, in addition to paying the maintenance charges, the users had to pay one-seventh of the cost of the battery for seven years, and the odds were that the undertaking would show a deficit for seven years. It was a difficult matter to accommodate large batteries on existing sites. He could quite imagine the inadequate training of engineers had had a very obstructive effect on the installation of large batteries in medium-sized undertakings. As to the floor upon which to place the battery, he had always inclined to the use of asphalt.

Mr. W. M. Selvey said the question of policy was the point they were all interested in. In the early days batteries were used in all sorts of ways for levelling up load, but to-day it had come down purely to a question of stand-by. In order to take full advantage of bulk supply they had to put in a big stand-by battery as an insurance. If that was so, it was one of the most serious statements in the paper. He agreed that they would always require batteries for some purposes, but the idea that they would have to become general for the bulk-supply system was certainly somewhat new to him.

Mr. W. H. Brown said the matter which chiefly interested owners in connection with the installing of batteries as a stand-by was the question of initial expense. The question of obtaining distilled water, too, might be a difficulty. One got from the makers a certain guarantee where the discharge capacity was based on a five-hours' rating, and he was informed that in the West Riding of Yorkshire that sort of thing was not of much use, the heavy discharges would run the battery out in much less than five hours. A further point was the lack of information with regard to batteries. He had often been told that there was a great difficulty in getting a book which dealt with batteries. As one who was hoping in due course to do away with small installations in favour of bulk supply, he was much interested to know that batteries were being used to secure continuity of supply. He certainly thought no kind of bulk-supply station would run, no matter what the supply was, without the supply being more or less frequently interrupted.

Mr. R. D. Spurr pointed out that suitably proportioned chimneys would draw off the gases, and provided the air inlets were at the floor level, and were well distributed, all dirt and grit would tend to settle on the floor, where it could be easily washed away without causing any dust. Fans were unsatisfactory as they created strong draughts and became corroded. The life of a battery would be better expressed as the total number of complete discharges and charges that constituted its life, say at the five-hour rate, and users could then form a better idea of the useful life remaining at any time by deducting the number of discharges from the total rated

life. With regard to channel bars, those at present in use were too rigid, and they should be made of a deeper inverted U section to allow for the working that was constantly taking place. Specially designed insulators should be freely used between the cells, so that one supported the others, and they should be made cylindrical, not less than 4 in. diameter, and perfectly smooth except for a single collar in the centre. With regard to floating batteries, too much floating resulted in very inefficient working. A battery should be discharged and charged at least three times every week to obtain a reasonable return for the capital expended on it.

Mr. J. C. Shaw was of opinion that the most important part of the paper was that dealing with the future aspect of storage batteries. He thought, however, the author had been a little unhappy in selecting America as a guide. He believed that with the proper interlinking of power stations and the use of batteries they could give an absolutely continuous supply. One speaker had said they must get a full output three times a week from a battery, but he (Mr. Shaw) believed that to make it pay they must get a full output twice a day.

Mr. Broekman said Mr. Shaw's contention that a battery had to be discharged twice a day was rather exaggerated. He personally was in favour of booster control.

The President pointed out that Mr. McKinnon had said: "Lead-covered cables are cumbrous," and that "the most satisfactory form of protection is lead covering with the further protection of a coat of grease or paint." He thought, in the first place, Mr. McKinnon meant lead-covered vulcanised cable, and in the second case the lead covering of copper conductors which could be used without any insulating covering whatever.

Mr. McKinnon, in reply, said with regard to channel bars being too rigid, they must remember that the bar was simply connecting up two plates. There was no continuous strain from one end to the other of long rows of batteries. Battery makers recommended a discharge once a week for a stand-by battery. Mr. Shaw had given the impression that the makers were suggesting that they should do the standardisation. He, the author, had suggested that the Institution should make the standardisation, and the makers fall in line.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The Westinghouse Lighting Dynamo for U.S. Military Motor Wagons.

A feature of the standard design of military petrol motor wagons adopted by the U.S. War Department, is the provision of an electric lighting set. To meet the arduous work such vehicles are likely to be subjected to, the Westinghouse Electric & Manufacturing Co., of Pittsburg, have recently introduced a specially-designed, cam-regulated generator. Although it is capable of developing a continuous output of 12 amperes at 7·5 volts, the machine is ordinarily adjusted at the factory to give a voltage not greater than 8 volts at 1 amp. output, at speeds up to 2,000 r.p.m., and with a load of 15 amps. to give not less than 7 volts up to the same speed. In general appearance the machine is similar to other generators of Westinghouse manufacture, the frame being made from circular-section steel tube which lends itself to cradle mount-

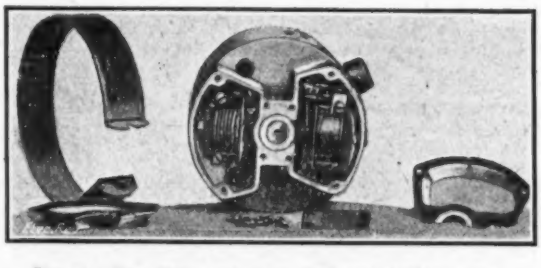

Fig. 1.—End View showing Cut-out Switch and Regulator.

ing on the engine. The end brackets may be extended to form flanges for end mounting, in which case the cradle brackets are not required. The construction of the armature shaft and regulated generator parts follows the customary lines; the windings are strengthened both mechanically and electrically by a double impregnating treatment which renders them oil and water proof. Four brushes are provided on the machine in place of the usual two, and the field coils are securely located on the poles and highly insulated, the lighting set working on the single-wire, earth-return system.

It is in the cut-out switch and voltage regulator, fig. 1, that the apparatus differs from other types. The cut-out and regulating units are mounted within the bracket on the commutator end; the cut-out is on the left and the regulator on the right, removable covers being provided to give access to both. The cut-out is adjusted to close the circuit to the battery when the speed of the generator reaches such a point as to give a pressure of 6·5 volts at the generator terminals; it opens with a reverse current of one ampere and at a speed below the cut-in speed to avoid any tendency to chatter when the generator is running near the cut-in speed; the latter varies from 5 to 10 miles per hour, according to the gear ratio and wheel diameter of the particular vehicle to which the generator is fitted.

Referring to the regulator, movement of one of the contacts is caused by a cam on the generator shaft, so that the operation is positive, the contacts being either in intimate contact or entirely open; a slight wiping action is, however, provided in order to keep the contacts clean. The effect of opening and closing the regulator contacts is to cut in and out a resistance connected across the con-

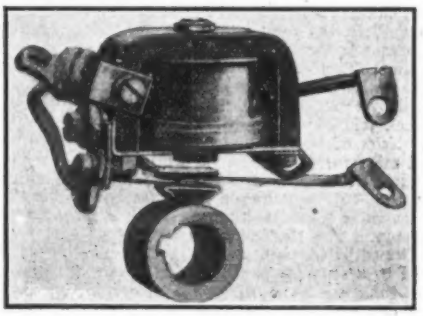

Fig. 2.—Regulator.

tacts and in series with the shunt field winding of the generator, the time the contacts are closed varying with the speed. It is claimed that the generator is able to maintain a proper voltage and current output, even if the battery becomes disconnected. It may be added that an opening in the end bracket affords access to the regulator adjusting screw.

The action of the regulator may be followed from fig. 2. The contact connected with the armature moves backwards and forwards with the latter to and from the end of the armature core as the amount of flux through the core varies. Thus, if the voltage tends to increase, the top contact will be withdrawn from its mean position, while if the voltage tends to decrease, the upper contact will approach the lower one, and thus make the duration of contact longer in each revolution. Adjustment is made by bending the brass piece at the outer end of the steel frame of the machine and thereby moving the armature nearer to or further from the core, as may be desired.

The Bijur Electric Engine Starter with Automatic Engaging Gear.

A good deal of ingenuity continues to be shown in connection with electric motors employed on petrol motor vehicles for engine-starting purposes, especially as regards the method of bringing the driving pinion of the motor automatically into engagement with the toothed ring formed on or connected with the engine flywheel. The accompanying drawing shows in section what is known as the automatic direct shift adopted on a new series of engine starters, which has recently been introduced by the Bijur Co., of Hoboken, N.J., U.S.A. As will be seen, the mechanism consists of a pinion attached to a barrel-shaped casing mounted on the end of the motor armature shaft. When the starting switch is closed, causing the armature shaft to rotate freely, the inertia of the drive mechanism prevents it from revolv-

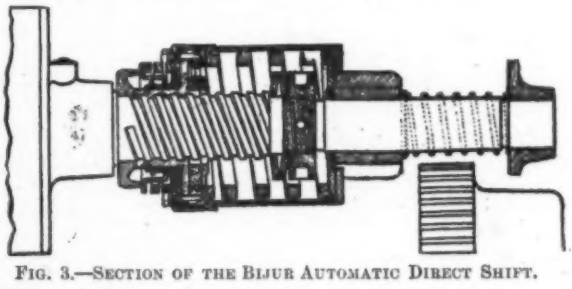

Fig. 3.—Section of the Bijur Automatic Direct Shift.

ing as a unit with the shaft, with the result that the whole mechanism travels longitudinally along the shaft, moving the pinion into mesh with the teeth on the flywheel. In case the pinion teeth do not mesh smoothly with the flywheel, but "butt" end to end, which it has been demonstrated happens approximately once per 300 starts, the mechanism does not jam or injure the teeth; the pinion merely compresses the large spring in the barrel, as it tends to move backwards, until the clutch mechanism exerts sufficient force to rotate the pinion so that it snaps into mesh with the flywheel. The direct shift is mounted directly

on the armature shaft of the motor, the screw threads being cut on the shaft instead of on a separate sleeve, thus enabling a shaft of larger diameter, and of considerably greater strength, to be used.

Electric Tramcar Cooking Equipment.

The electric cooking plant of the Halifax Corporation tramcar, which was recently fitted out as a travelling national kitchen, and to which we briefly referred in our last issue, under the heading of "Tramway and Railway Notes," was made by MESSRS. BELLING AND CO., Montague Road, Upper Edmonton, London, N. 18.

The cooking plant consists of two baking or roasting ovens, each 32 in. high × 22 in. wide × 21 in. deep inside, and fitted with six racks spaced 5 in. apart, the actual size of each rack being 18¾ × 19½ in. The ovens are constructed of sheet metal on angle iron framing, and are adequately lagged. The loading is 6 KW., divided into four sections, controlled by four quick-break rotary switches fitted on the oven framing. There are 24 heating elements, 12 on each side, all interchangeable and easily fitted; ready inspection can be made of all the interior work by removing the racks and lifting off the runner frames. No asbestos covered wire is used in the wiring up, all connections being stiff heavy conductors, open for inspection and well guarded. For steaming, four steam cooking ovens are provided each 16 in. × 16 in. × 24 in., and fitted with four shelves. The loading of each is 3 KW., controlled by three indicating switches fitted on a separate sheet iron panel, and connected to the steamers by flexible metallic tubing. Each of these steamer cookers is fitted with a group of standard mica former elements, all interchangeable and independently connected. For soup making, vegetable boiling, or stew making, a 25-gallon boiling pan is provided; this is fitted with an outer casing for heat insulation, and is provided with a large draw-off tap. The loading is 9 KW., divided into four sections, and controlled by four quick-break rotary switches. The switches are fitted to a separate panel, connected to the boiler by flexible metallic tubing. As a further means of making soup, and carrying out small boiling operations six 12-in. hot plates are provided, each of these being fitted with a light tinned-plate boiling pan of about 4 gallons capacity. Each hot plate is loaded to 2 KW. on two sections controlled by two switches mounted on a separate panel, and connected by means of flexible metallic tubing to the hot plate. The whole of the apparatus is arranged to work on a 550-volt circuit with one pole earthed, and it is interesting to know that the whole of this plant was put to work without the least trouble, not a single fuse being blown during the conecting up, and testing, and subsequent cooking operations. All the plant is thoroughly well earthed, and it is difficult to see any possibility of anyone obtaining a shock. The wiring arrangements are as generally carried out on a tramcar system, the live pole being taken through a fuse on to the switch panel in each case, and the neutral or return pole being connected straight on to the other main terminal on the panel. The two ovens will cook 720 1-lb. portions of pie or similar per hour in two batches, each batch taking half an hour to cook (consumption about 12 units); or 600 fish cakes, each 3½ in. diameter or similar per hour in two batches (consumption about 12 units); or 360 portions milk pudding per hour in one batch (consumption about 8 units); or 108 lb. bread per hour in one batch (consumption about 12 units). The four steam cooking ovens will cook 1,152 dumplings (2½ in. diameter) per hour in two batches at a consumption of about 12 units; or 160 lb. potatoes (320 portions) at a consumption of about 12 units, and other vegetables such as carrots, parsnips in a similar manner and consumption. The working capacity of the boiling pans under the particular conditions obtaining on this installation is approximately 33 gallons (350 portions of ½ pints each), soup, stews, &c., or the pans can of course be used for vegetable boiling if desired. A travelling kitchen of this nature has a very great practical utility; it can be run into the central food preparing depôt, the cookers filled with food, and the cooking commenced at once, and continued whilst the car is on its journey to a suitable distributing centre, such as, for instance, suburban "dead ends," loops, &c.

Electric Steel on the Rand.—A second electric furnace is now being erected at the Robinson Deep, where the existing plant is turning out 70 or 80 tons of shoes and dies per month, meeting, say, 10 per cent. of the requirements of the mines. When the second furnace is installed, it is hoped that there will be a regular output of 100 tons per month. An advantage of this extension will be that there will be no necessity to cease operations when a furnace has to be relined. Since it is impossible to import electrical material for a new furnace, odds and ends have to be collected from mining places, but as in the case of the existing plant, the difficulties are being overcome.—*Cape Times.*

Observing Blade Clearance in Turbines.—According to German Patent No. 288,626 granted to Fr. Krupp A.-G., a steam-tight inspection window is provided in the housing of the turbine. If desired, a number of such windows may be provided at different points round the housing, so as to permit inspection of the blade clearance over the whole length of the turbine without unduly weakening the housing. The sector of guide blades which spans the inspection window may be milled from the solid or built up from component parts, soldered or riveted together so as to be of sufficient strength. The window extends over at least one ring of moving and one of stationary blades.—*Elektrotechnik und Maschinenbau.*

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Trade in Canada.

According to the statement of the British Commissioner in Canada, which appeared in the ELECTRICAL REVIEW some time ago, in the majority of cases of American loans to Canada, it is a condition of the contract that the funds advanced shall be expended on goods produced in the United States.

In the years 1910-13, during which period I was in Canada, I observed with surprise that, as far as I could gather, there was no move on the part of any of the British financial interests to make any proviso that the money they advanced should be expended, as far as practicable, on goods made in the United Kingdom where these were available and met the market conditions; and, failing this on Canadian-made goods, using foreign-made goods as a last resort.

From the table you give for the years mentioned above, the percentage investment of new capital by the United Kingdom in Canada was 81·5, 76·56, 72·65, and 74·25.

During the war the U.S.A. have practically taken the United Kingdom's place in this respect.

In view of the enormous amount of money which the United Kingdom advanced to Canada, it will be realised what a tremendous amount of business was lost to us from neglect and want of foresight on the part of the British financiers.

I would like to say right here that it would be folly to invest money in a country and then make that country purchase something which it did not want and which did not meet its requirements; but there is very little doubt that a great deal of the money advanced by the United Kingdom could have been made still more profitable to this country by seeing that where we made suitable goods, and at a reasonable price, these should be purchased in preference to those from anywhere else.

When the country is again in a position to loan money, it is to be hoped that the financiers will use more foresight.

The above arguments hold good equally for British investments in any part of the globe.

G. F. Sills.

Manchester, *April 30th*, 1918.

Economy of Large Steam Turbines.

In your article on "Large Steam Turbines" in the issue of your paper dated April 26th, you refer to the steam consumption guarantees which were given in connection with the 25,000-KW. turbo-alternator supplied some years ago by Messrs. C. A. Parsons and Co., Ltd., for the Fisk Street Station of the Commonwealth Edison Co., U.S.A.

Although, as you state in your article, these guarantees indicate a very low steam consumption, it occurs to us that it may interest your readers to be referred to the article in your issue of December 19th, 1916, headed "Economy in Power Generation and Distribution." This article deals with an address delivered under the auspices of the American Society of Mechanical Engineers by Mr. Samuel Insull, where he gives a curve showing the *actual* steam consumptions obtained under test on the plant referred to above. To save your readers referring back to this article, I give in tabular form the points from which this curve is plotted compared with the guarantees above mentioned. These figures show the very high economy actually attained on this machine :—

STEAM CONSUMPTION.—PARSONS TURBO-ALTERNATOR.
Stop-valve pressure, 200 lb. Superheat, 200° F. Absolute pressure in condenser, 1 in. mercury.

GUARANTEE.		ON TEST.	
Load KW.	Lb. per KW.-hour.	Load KW.	Lb. per KW.-hour.
10,000	12·5	10,230	11·43
15,000	11·65	14,000	11·0
		18,400	10·68
20,000	11·25	20,060	10·46

It may be of interest to your readers to know that recent tests taken after the plant had been running almost continuously for nearly four years show that the steam consumption is still exactly the same as it was early in 1914.

A. H. Law.

Newcastle-on-Tyne, *May 6th*, 1918.

The 12½ Per Cent. Bonus.

With reference to the recent award of 12½ per cent. bonus granted to all workers engaged in the electrical industry, I shall be interested to have an official ruling as to the position of technical and central station clerks who are wholly engaged upon the preparation of statistics, technical records, stores books and other data, including all work connected with the men's wages.

As you may be aware, the position of the technical clerk is vastly different from that of the ordinary commercial clerk, inasmuch as in the former case his duties are of a specialised character, and demand not only special training in his particular class of work, but also a good general knowledge of the fundamental principles of the running of electricity power stations.

In view of this, the technical and station clerk is, in his capacity, surely as essential to the efficient running of a power house as

other members of the works staff, and if, for instance, the 12½ per cent. bonus be granted to the storekeeper, who probably works under the direct supervision of the clerk, it is obviously grossly unfair to the clerk to be precluded from participating in the award.

I thought the question would be of some interest to your readers, as, doubtless, there are many in a similar position who have very hazy ideas as to the correct interpretation of the award in this connection, and I shall feel grateful if any of your readers could enlighten me on the subject.

Technical Clerk.

[This question has been raised on several occasions already. There is no definite ruling on the point as yet.—Eds. Elec. Rev.]

Tubular Earths for Lightning Conductors.

With reference to the above very interesting article in this week's issue, I would like to ask the author by what method of testing "the constant resistance of under 5 ohms was obtained," and what was the nature of the test applied to "the large number of tubular earths sunk by Messrs. W. T. Furse, of Nottingham, to obtain the value of 1 ohm"?

Mains Superintendent.

The Electrical Power Engineers' Association and the Association of British Electrical Engineers.

In your footnote to this correspondence published in your issue of May 3rd you state that the question whether the Association of British Electrical Engineers shall or shall not be registered as a Trade Union is of the first importance. I respectfully beg to differ, and to submit that the point of first importance is whether, considering that the Electrical Power Engineers' Association is an accomplished fact, that it has done the pioneer work of organisation, that it is taking a strong line in the direction of improved efficiency, pay, and status for electricity supply engineers, and that it is the staff engineers' own Association, brought into existence by their own unaided efforts, there is the least justification for proposing, so late in the day, to form a new body with the same objects in view and recruiting from the same class of engineers.

I certainly consider that, as unity is our most urgent need, any proposal to set up a new protective body is disastrous, and any support given to it by staff engineers is unwise and unfair to both themselves and their colleagues.

E. B. Pausey.

Bury, Lancs., *May 3rd*, 1918.

LEGAL.

Osram-Robertson Lamp Works, Ltd., v. Goossens, Pope and Co., Ltd.

In the Chancery Division, on May 3rd, counsel made application to Mr. Justice Astbury for judgment in default of defence in this action.

His Lordship, after the usual inquiry as to the proceedings being in order, entered judgment for the plaintiffs in the terms of the motion.

Calmont King & Co., Ltd., v. Brain.

In the City of London Court, on May 2nd, before his Honour Judge Atherley-Jones, K.C., plaintiffs, of Milton Street, E.C., sued Mr. C. Brain, trading as the Bleriot Cycle Co., Bristol, for £5 2s. 2d. for refills for electric lamps supplied. The question in dispute was whether or not the refills were of the quality ordered. They were sold by description.

Mr. Harry Strouts, for defendant, said they were guaranteed for three months from the date they left plaintiffs' premises.

Plaintiffs' Solicitor said that the goods were delivered in February and March. In May defendant returned the refills sued for, and complained that they were not of the quality ordered. They were of 4 volts—the proper strength. When they came back they still registered 4 volts, the guaranteed standard. Defendant returned the batteries in May, when there was plenty of daylight and not many lamps were required. It was the off season, and the defendant, being overstocked, tried to get rid of those on hand.

Edward Dumphy, plaintiffs' representative, said that he tested all the batteries before they were sent out. Defendant kept them over three months. During that time refills might easily deteriorate, depending on the conditions under which they were kept. Refills left over from one season to another would be absolutely useless.

In cross-examination, he said they often had batteries returned through being defective, and so did other firms. Very few were sent out defective. Sometimes they stopped on the railway too long, and then became overheated, and dampness would cause them to sweat, which set up a leakage.

Mr. A. G. Mardin, director of the plaintiff company, said that the returns due to defects were usually not more than 3 per cent. or 4 per cent. Defendant's returns were unreasonable.

Defendant denied that he sent the batteries back because it was the end of the season. They were not up to the guarantee two weeks after arrival, and he returned them. Some firms' batteries were good after being nine months in stock. Plaintiffs' batteries were 2½ volts only. He warmed them up, and they revived for half an hour, but they soon went down again. He had returned thousands of batteries to one firm or another without objection.

Judge Atherley-Jones, K.C., found for the plaintiffs, with costs, but said he did not feel very certain about his decision. Defendant dealt with the matter in a foolish way.

Hemming v. London Electric Railway Co.

Mr. Justice Bailhache, sitting with a special jury in the King's Bench Division, on May 3rd, heard an action in which Mr. Henry Q. R. Hemming, a solicitor, sought to recover from defendants damages for personal injury arising out of an accident to their lift at the Russell Square Tube Station.

The case submitted by the plaintiff was that while he was in the lift with about 50 other passengers, it jammed. There was much alarm amongst the occupants, and considerable shouting by the young woman in charge. Suddenly one of the walls fell back, and it proved to be a secret door, behind which the plaintiff found himself. In the meantime another lift had been brought alongside, and the people thronged through the emergency door into the second lift. When the plaintiff, according to his account, attempted to step across the space between the two lifts, he fell with his leg between them, causing the injury complained of. He said that he subsequently discovered that the space into which his leg went was wide enough to have allowed him to fall to the bottom of the shaft. He suffered injury to the knee which incapacitated him for some time, with the result that during that period he lost £15 a week, partly in fees for massage manipulative treatment, to which he had devoted himself for some years past, and partly from a book on physiology on which he was engaged. He admitted, in cross-examination, that the injunction to "mind the step" was in his mind and that he had seen the people stepping up from the one lift to the other.

Mr. Justice Bailhache held that there was no evidence of negligence on the part of the company or their servants, and directed a non-suit against the plaintiff.

Factory Acts Prosecution.

At the Sheffield Police Court, last week, at the instance of Mr. J. Law, H.M. Inspector of Factories, Messrs. Thomas Firth & Sons, Tinsley, were summoned for breaches of the Factory Acts. According to the *Sheffield Telegraph*, Mr. Law stated that a cable under the high pressure of 11,000 volts in the transformer house was covered with about four thicknesses of "Empire" wax-covered tape, which was not sufficient insulation for a conductor of such high pressure. There was no metal screen round the cable, such as now had been suggested by the Factory Inspectors. A sweeper named Jenkinson was killed.

For the defence, Mr. Neal said the firm had done everything necessary to prevent accidents. At the request of the Ministry of Munitions they had put up certain works, but they were not yet finished, and it had not been possible completely to insulate this cable, and even a metal fence round it would not entirely safeguard those working near it. Jenkinson had no necessity to come in contact with the conductor in the course of his regular duties, as the transformer house was thoroughly cleaned each Sunday, when all current was cut off. He must, therefore, have been taken ill, and caught his brush against one of these live transformers, which was in a pit. It was not necessary, he contended, for the man to act constantly under the eye of the foreman. He was "a competent person acting under the immediate supervision of an authorised person."

The Chairman pointed out that Jenkinson was left three hours without supervision, which was a very risky proceeding.

A fine of £20 was imposed.

Assault on a Non-Union Man.

A case in which the prosecution relied upon the Trades Disputes Act of 1906, was heard at Great Marlborough Street Police Court on Tuesday, before Mr. Denman, it having been adjourned from a date in April, when one man was charged with an assault, but now there were two defendants, the further one being summoned. All the trouble had apparently arisen through the employment of a Non-Union man, in what was described as "a Union shop." The prosecutor, Mr. Albert Edward Muller, an electrical fitter, was employed by the New System Private Telephone Co., Ltd. He charged A. E. Owen that he did at Great Portland Street and Euston Road unlawfully use violence, and intimidate A. E. Muller, with a view to compelling him to abstain from pursuing his employment. There was also a summons against G. D. Turner that he did unlawfully watch or beset the premises where A. E. Muller was employed, and the approach to the said premises, and intimidate him and follow him with two or more persons, in a disorderly manner, and hustle him and threaten him with violence, with a view to compelling him to abstain from his lawful employment.

Mr. Ganz (barrister) appeared for the prosecution, and Mr. Zefferti was counsel for both defendants.

When the case was called on Mr. Zefferti said he had carefully gone into the evidence, and thought it was a proper case to go for trial. The charge against Owen was one of violence, but that against Turner was not so grave. They were under the Conspiracy and Protection to Persons Act of 1875 and the Trades Disputes Act of 1906. The magistrate would, of course, bear in mind that he might not find it necessary to send it for trial.

Mr. Ganz then said that the two defendants and Muller were in the employ of the New System Private Telephone Co. The prose-

cutor was a Non-Unionist, and the defendants were members of the Electrical Trades Union.

Mr. Denman said the case had already been opened, and it would save time if he read over briefly the depositions of Muller at the previous hearing. He said that at 8 o'clock on April 29th defendant approached him, and said: "Are you Muller?" to which he replied, "Yes." He was then asked if he was a member of the Electrical Employés' Union, and on saying "No," was told that he would be given one week to join. His answer was, "Let's get the war over first." He went to Tottenham to get a job, and on his return at 12.30 there were a number of men at the entrance, who abused him, and threatened him if he did not join the Union. He went in and got his bag of tools, and then went up Great Portland Street, when he was stopped by Turner, who afterwards followed and abused and pushed him. Turner followed him into Euston Road, and then, at a sign, Owen came across the road and knocked him down. While on the ground he was hit again. He got up and walked to the corner, and those that had followed him went away. Prosecutor went back to the shop and complained.

Muller was now recalled and examined by Mr. Ganz. He said he had been employed by the firm before, but again went into their employ in April as an electrical fitter. He was not a member of the Electrical Trades Union. When he went into their employ he was not asked about the Union, and did not know that the largest number of their employés were members.

Mr. Zefferett: You can take it from me that it is so, although it does not matter.

Mr. Ganz: It is important, because, unfortunately, the Act does not say it is wrong to use violence, but it is wrong to use violence to cause anyone to abstain from doing his lawful work.

Muller went on to say that after doing a job at Tottenham he returned at 12.30 p.m., and as he went in at the door he was approached by a number of men. Owen told him he could not go into the premises because he was not a member of the Trade Union. He went in and fetched his tools and walked towards Great Portland Street, where he was struck in the left and right eyes by Owen.

Continuing his evidence, Muller denied that he went there with the idea of breaking it up as a non-Union shop. When he was engaged, Mr. Murray, the chief engineer, asked if he was a Trade Unionist, and he said, "No; but I suppose I shall have to join it now." Murray said it did not matter, so far as he knew.

Prosecutor agreed that there were a number of silver-badge discharged soldiers, which he did not know prior to the assault, but Mr. Murray never said he wanted to get rid of them. On the Friday there was a committee meeting of the Union, which gave him a week to join. There was a conversation between him and a man named Power, who turned out to be a wounded soldier who told him that it was only such as him that were keeping wounded soldiers out of jobs, and this he denied. He declared it to be untrue that he ever suggested that they were fools to join up and get wounded, and that he had taken particularly good care to get protection.

In the course of the hearing, when the depositions were read over to Muller, Mr. Ganz objected to the suggestion that he had German antecedents, for, as a fact, he was not German born, nor was his father.

Medical evidence as to injuries was then given.

James Jones was next called, and was wearing a silver badge. He said he was in the same employ, and was there from March, 1917, as an outside hand, and now as a storekeeper. He had been a soldier, wounded, and was discharged from the Army. He was not a member of the Electrical Trades Union. He was outside the premises on the day in question, and saw Morgan, Turner and Collis; he did not see Owen. Muller came out, and Turner got in front of him, not exactly pushing him, but obstructing him. The other men also followed him, but he did not see anything further happen. There were others also who wore silver badges, which everyone could see. He had been asked on numberless occasions to join the Trade Union, but had not done so. He had never been assaulted in consequence, but had been "told off" very often. He had continued to stand out, however, and meant to do so, but had only one leg, and so had Collis.

Mr. Ganz: Who had asked you to join the Trade Union?

Witness: Nearly all of them from time to time.

Mr. R. L. Murray, chief engineer in the employ of the firm, said he was not a member of the Electrical Trades Union. So far as he knew, there were two who were not members, and all the rest were. At 8.30 on the morning of April 29th, Owen came to his office and put a paper there to the effect that a shop meeting of the Union had passed a resolution that if Muller was engaged he would be given one week to join the Union, failing which they would down tools. They also asked for other guarantees as to work, &c.

Mr. Denman: But the proper officials of the Union would naturally object to violence, so what have they to do with the acts of somebody who takes the law into his own hands?

Mr. Ganz: I am going to show that Owen is the shop steward, and I have to prove that there is something in the way of causing to abstain from work; it is not sufficient under the Act to prove the assault.

Witness went on to say that he asked for a day to consider the matter, and Owen said he thought that was fair, and he would put it to the men. He went outside, was gone half a minute, and came back and said the men would not stand it, and were going to down tools.

In cross-examination, Witness said he did not know that it was a Union shop, because he had engaged men who were not in the Union, who afterwards did join. It was true he asked Turner when he engaged him if he was a member of the Union, but that was only because under the Defence of the Realm Act he was entitled to see all papers. He did not use persuasion one way or the other. He had no intention of trying to turn this shop into a Non-Union shop.

Mr. Zefferett put a piece of paper to the witness, and Mr. Denman asked what it had to do with it, and counsel replied that he wished to show how much this man could be believed when he said one thing in the box and wrote another.

Mr. Denman: I should keep to the point: but let us hear what the paper said.

Mr. Zefferett then started to read the paper, which he said was in the form of an agreement.

Mr. Ganz: Unsigned.

Mr. Zefferett went on to read that this was intended for anybody that was to be engaged, in which the firm bound the person not to join a Trade Union while in their employ, and offered to refund any money such men might have paid into a Union in War Certificates.

Mr. Denman: It shows nothing more than that Mr. Murray was inconsistent.

Mr. Zefferett: If I do not further cross-examine I must ask Mr. Ganz not to take the point that I have failed to raise any point on the agreement.

Mr. Ganz: I do want the witness to say if the firm accepted the terms of the agreement.

Mr. Denman: What does it matter?

Mr. Ganz: At the trial the Judge will ask why the questions were not asked.

Mr. Denman: Then tell the Judge it was because the Magistrate said it was better to keep to the point in the prosecution.

Mr. Zefferett: And the Judge will say what a wise Magistrate, and we shall all agree.

Mr. Ganz pressed for an answer to the question, and the Witness said the agreement was never entered into or acted upon by the firm.

Mr. Ernest Low, general manager to the firm, said that on the day in question he saw that the men were not working. Later on he heard of the assault, and saw the prosecutor.

The Magistrate said that he had heard enough to commit both defendants for trial.

Mr. Ganz: I ask particularly that the committal shall be under the Act, and not for assault only.

Mr. Denman said he thought it would be sufficient if they were committed for trial, Owen for assault and Turner for intimidation and following in a disorderly manner, under Sec. 7 of the Act.

The Magistrate declined to hear the evidence for the defence, which, it was suggested, would throw a great deal of light on the causes of the squabble, saying that he took a strong view as to the materiality of such evidence. The charge was one of assault, and it was useless to go into side issues on such a plain, straightforward case.

The defendants were then committed for trial to the Sessions bail being fixed at £40 each.

The Post Office Tube Railway.

Arbitrator's Award.

Mr. J. H. Oakley, as Arbitrator, has announced his award in the claim by the Great Eastern Railway Co. for £33,393 compensation from the Postmaster-General by reason of the taking of so much of the sub-soil as is required for the Post Office Tube Railway at Liverpool Street Station, and for injurious affection to adjoining lands by the carrying out of such works.

The Arbitrator says:—"I award and determine that the sum of £6,884 be paid by the Postmaster-General to the company for the acquisition of such easement or right of user of the sub-soil of the lands of the Great Eastern Railway, and that a further sum of £2,680 be paid by the Postmaster-General for or in respect of damage to be sustained by the company by reason of the severance of the said lands of the company or otherwise injuriously affecting the said lands by the exercise by the Postmaster-General of the powers conferred on him by the Post Office (London Railway) Act, 1913, or the statutory provisions incorporated therewith."

Reconstruction.—Yesterday evening there was held at Southwark Town Hall, under the joint auspices of the National Alliance of Employers and Employed and the Industrial Reconstruction Council, a mass meeting to promote "Self-Government for Industry." The speakers included the Right Hon. F. Huth Jackson and Mr. Ernest Benn, chairmen of the two organisations.

We welcome this joint effort of the two bodies, for everything is to be gained by concentrating our efforts in place of duplicating or overlapping. We are pleased to note from the report of the Industrial Reconstruction Council, which, since the meeting held at the Guildhall, has held public gatherings at Manchester, Nottingham, Edinburgh and Birmingham, that the Council has, through its president and chairman, been in touch with the Federation of British Industries, the National Alliance, the London Chamber of Commerce, the Engineering Employers' Federation, and the Industrial League. There is evidently a desire to establish suitable relations between all the bodies which are interested in industrial reconstruction, and we hope that some means of united effort will be found practicable. We agree that there is a vast amount of educational work to be done in order that employers and employed may alike fully understand what is meant by the self-government of industry, and what are the benefits likely to accrue from such a policy after the war.

WAR ITEMS.

Trading with the Enemy.—The "London Gazette" for May 3rd contains a further list of bodies and persons in the following countries with whom trading is prohibited:—Bolivia, Brazil, Costa Rica, Greece, Guatemala, Mexico, Morocco, Netherlands, Netherland East Indies, Norway, Panama, Portuguese West Africa, and Spain.

Ministry of Munitions Boiler Order.—The Ministry of Munitions orders every person to furnish to the Controller, Department of Engineering, such returns as to boilers belonging to him, or in his possession, or under his control, as may be required by the said Controller. The Order is described as "The Boilers (Returns) Order, 1918."

Restricted Occupations Order Revoked.—The National Service Order of February 28th, 1917, placing certain scheduled industries and occupations under restrictions has been revoked.

Electric Lamp Glass Control: Revised Order.—The Ministry of Munitions has issued an Order amending the Glass Control (Consolidated) Order, 1917. It has been found necessary to extend the provisions relating to electric lamp glass contained in the order, to vitrite and other glass used or intended for use in electric lamp caps for insulating purposes which were by that Order expressly excepted from the operation of such provisions. It is now ordered that as from May 7th the Order shall read and take effect as if in Clause 8 the words "and the expression 'electric lamp glass' shall include all glass used or intended for use in the manufacture of electric lamps, not excepting vitrite or other glass used or intended for use in electric lamp caps for insulating purposes, but shall not include glass shades and similar accessories" were substituted for the words "and the expression 'electric lamp glass' shall include all glass used or intended for use in the manufacture of electric lamps, except glass used or intended for use in lamp caps for insulating purposes, but shall not include glass shades and similar accessories." All applications in reference to the Order should be made to the Controller of Glassware Supply, Ministry of Munitions of War, 22/23, Hertford Street, London, W.1.

Hull Corporation Electricity Staff.—An interview recently took place between a deputation of the Hull Corporation Electricity Committee and the Ministry of Munitions in regard to the calling-up of two skilled employés, and as a consequence the calling-up notices have been suspended. The opinion expressed by the Committee at their last meeting was that the calling-up of further skilled employés would jeopardise the efficiency of the undertaking. It was decided that the 12½ per cent. bonus granted in accordance with Sir George Askwith's award should apply to 11 technical assistants, and date from October 13th last, the same as in the case of other workers affected by the award.

Electric Supply and Red Cross.—By supplying electrical energy free of cost to the local Red Cross Hospitals, the Swansea Electricity Committee in effect are contributing £400 a year to these institutions.

War Effects on Australian Electrical Trade.—The *Sydney Daily Telegraph* states that the effect of the war upon the electrical industry is referred to in the annual report of the Electrical Employers' Association of the State. This effect, which is injurious, has been increasingly felt during the last 12 months, as power-houses, mines, and other industries have been unable to obtain supplies of machinery needed for extensions. A bright feature of the situation, the report proceeds, lies in the stimulus given to local manufacture of accessories, such as starters, switchgear, and so on. These were imported previous to the war.

Sale and Purchase of Machine Tools.—It is announced officially that power-driven machine tools or wood-working machines and treadle lathes for wood-working or metal (3-in. centres and over) come under the Defence of the Realm Regulations (Regulation 30 A). Intending purchasers must make application for permission to purchase the machines they require to the Executive Officer of the Area Clearing House Board in their district. Firms (including auctioneers) must obtain permission to sell machines from the Controller of Machine Tools, Charing Cross Buildings, Embankment, W.C. 2.

Exemption Applications.—In applying for a coachmaker, the only man of that trade in the department, Mr. Pilling, manager of the Accrington Corporation tramways, told the Tribunal that this man's work had increased greatly owing to the inexperience of motormen, there being more collisions. Temporary exemption to September 12th was given.

At Brierley Hill, Mr. J. Holmes defended a National Service Appeal against exemption held by an electrical engineer (29, C 1), the only man left for this class of work, and engaged on motors and electrical appliances at works in the district. Mr. Holmes said that his own son was in the Army, and his partner had died. The appeal was refused, and the exemption confirmed.

The Warsop Tribunal has refused to grant exemption to J. Sockett (22), electrical engineer.

At the Berks. Appeal Court, the National Service Representative appealed against conditional exemption granted to P. G. Lovegrove (35, B 1), electrical fitter with Mr. J. Bond, boatbuilder, on the ground that the man was engaged in a non-essential occupation. Mr. Bond denied that this was so, and said that a good deal of what the man did was war work. The appeal was respited with the object of a protection certificate being applied for.

At Lancaster, a firm of electrical engineers appealed for an electrician (40, Grade 3). He was given until July 31st. The Corporation appealed for a tramway inspector and occasional driver (41, Grade 2), who was stated to be necessary for supervision with the present inexperienced staff. The appeal was dismissed as from the end of May.

Essex Appeal Court has granted conditional exemption, whilst engaged in the tramway department of the Leyton U.D.C., to B. Hayes (41, Grade 3).

At Carlisle, the National Service Representative appealed against exemption granted to H. Ellison (Class A), electrical engineer and fitter with Messrs. R. M. Hill & Sons. It was asserted that the man spent about half his time on domestic work, and was of the class of men required at the present time. For the firm, it was contended that the man's work was mainly in connection with repair work for motors in the big works at Carlisle, and at times he had to assist the Corporation electrical department. The appeal was dismissed.

Torquay Tribunal has decided that E. J. Rawlings (Grade 2), traffic inspector on the tramways, shall be called up by May 15th, and has adjourned for grading an appeal by W. Drury, electrical engineer.

On the appeal of the Tramway Co., the Kidderminster Tribunal has granted exemption until September 30th to E. Turner (37, Class A), car-shed man, and J. Whitmore (31, Grade 2), driver.

On the recommendation of the Advisory Committee, the Rochdale Tribunal has granted exemption until August 31st to B. R. Eves (37), conductor and motorman on the Corporation tramways.

At Northampton, on Tuesday, an appeal was made for the renewal of the certificate of P. Penn (35, Grade 1), a foreman carter engaged in carting coal for the Northampton Electric Light & Power Co. It was stated that the man was responsible for the removal of 68 tons of coal from the railway station daily, and for seeing that the trucks were kept clear in order that they might be utilised again at the earliest possible moment. Two months final was given, and when a request was made that the finality should be subject to substitution, the Chairman said substitutes for positions of this kind could not be found.

BUSINESS NOTES.

Paper Shortage.—Owing to the great and growing shortage of paper, the public are requested to exercise the greatest economy, particularly in the matter of stationery. Much of the notepaper now in use is extravagant in size and quality. There is also room for the practice of paper economy in packing departments and stores and in many manufacturing activities.

Commercial Apprenticeships.—The L.C.C. has agreed to co-operate with the General Electric Co., Ltd., in a scheme whereby the company will select about 12 apprentices yearly from boys between 15½ and 17 years of age who are specially recommended by the principals of evening institutes, or by headmasters of secondary or central schools, or have passed the London matriculation or an equivalent examination. The company bind themselves to allow the apprentices facilities for attendance at evening classes on three nights a week over a period of three years, and have submitted for the Council's approval a draft indenture of apprenticeship. The L.C.C. is satisfied that the company's scheme and the indenture of apprenticeship are such as can be approved, and that the prospects offered by the company's service are such as to justify the Council in assisting the company to obtain apprentices.

The Sterling Athletic and Social Club.—The Lady Footballers of this club (Sterling Telephone and Electric Co., Ltd., Dagenham) on Saturday last brought their season to a close at the Gordon Club Ground, Ilford, when they met the London General Omnibus Co.'s Forest Gate Ladies' Team. The match was organised for the benefit of the funds of the Ilford Emergency Hospital. Mrs. Guy Burney, wife of the president of the Sterling Club, kicked off, and with Lady Griggs presented the medals at the close of the match, which resulted in a victory for the Sterling Team by 11 goals to nil, thus enabling them to wind up a remarkable season with an undefeated certificate, with a record of 20 games played, 18 won, 2 drawn, and a goal average of 103 against 10. The ball used in the match was sold by auction on behalf of the hospital funds, and was knocked down to Mr. Guy Burney for 35 guineas.

Trade Announcements.—Mr. E. C. Beman, having entirely severed his connection with the Electrical Supplies Co., of 233, Tottenham Court Road, W., Mr. Percy L. Davies, of Messrs. Downes & Davies, Liverpool and Manchester, has been appointed director in control of the company.

The Export Department of Messrs. Pass & Seymour (Inc.), of Solvay, N.Y., has been moved to 9, Church Street, New York City.

Catalogues and Lists.—BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Descriptive list, No. 2,142—B (40 pages) containing full information respecting their two and three-phase induction motors. There is a large amount of tabular matter and numerous half-tone illustrations of complete machines and parts thereof are given.

BRITISH THOMSON-HOUSTON CO., LTD., 77, Upper Thames Street, London, E.C. 4.—Folder giving "Hints to Electric Light Consumers," explaining the Government Lighting Restrictions Order. The notes tell how economies may be effected and how to read the meter. Quantities of the folder can be supplied to contractors, printed with their name and address, on application.

Munitions Dispute Settled.—It was officially announced on Saturday that a satisfactory settlement of the dispute at the Chilwell National Filling Factory had been reached at the Ministry of Munitions. A notice signed by Mr. W. J. Webb, London district secretary of the Electrical Trades Union, and Mr. H. P. Bolton and Mr. J. Potter, members of the Union, instructs all men concerned to resume work at once.—*The Times.*

Dissolutions and Liquidations.—LINOLITE CO., 25, Victoria Street, London, S.W.—Messrs. A. S. E. Ackermann and R. L. Matthews have dissolved partnership.

ELECTRICITY SUPPLY CO. FOR SPAIN, LTD.—This company is winding-up voluntarily. Liquidator: D. Merry del Val, 45, Grosvenor Place, London.

ELECTROLYTIC ALKALI CO., LTD.—Meeting of creditors, May 21st, at 24, North John Street, Liverpool. Liquidator, H. G. Alexander.

GRONDAL KJELLIN CO., LTD.—Meeting, June 7th, at 20, Abchurch Lane, E.C., to hear an account of the winding-up. Liquidator, Mr. G. H. Hill.

FIRTH & RUSSELL, electrical engineers, Kirkstall Road, Leeds.—Messrs. E. G. H. Firth, A. S. Russell, and H. F. Moore have dissolved partnership. Messrs. Russell and Moore will continue the business as Firth & Russell.

Patent Surrender.—The Comptroller-General gives notice that J. O. Callender and Callender's Cable and Construction Co., Ltd., have offered to surrender, under Section 26 (3) of the Act of 1907, Patent No. 104,793, for "Improvements in Multicore Electric Cables."

Book Notices.—*A Dictionary of Aircraft.* By W. E. Dommett, A.F.Ae.S., M.I.Mar.E., A.M.A.E. London: Electrical Press, Ltd. Price 2s. net.—The scope of this dictionary has been arranged to include all aeronautical terms, scientific, technical, and popular, and also symbols and abbreviations used in the leading aeronautical periodicals and text-books. It will form a handy reference book to those already possessing some technical knowledge of aeronautics, and will be found of much use to the wide circle of general readers interested in the problem of flight.

Short Logarithmic and Other Tables. By W. Cawthorne Unwin, F.R.S., LL.D. London: E. & F. N. Spon, Ltd. Price 1s. 6d.—This, the sixth, edition, contains tables which are intended to facilitate arithmetical calculations in those cases in which great accuracy is unnecessary. The accuracy and rapidity of calculations are increased if the logarithms of the constants and multipliers which most frequently recur are known, and tables of such constants are, therefore, appended. Tables of the weights of different materials and of iron of different forms are added to facilitate estimating, and these are arranged both for English and metric measures and weights. Care has been taken that all tables should be as accurate as their scope admits, and they have been made as brief and compact as possible.

Industrial Engineering: Present Position and Post-War Outlook. By F. W. Lanchester, M.Inst.C.E. London: Constable & Co., Ltd. Price 1s. net.—This consists of a reprint of the author's presidential address delivered before the Institution of Civil Engineers in December, 1916, and republished by permission of the Junior Institution of Engineers. It should afford great interest and food for thought to a wide circle of readers.

What Industry Owes to Chemical Science. By Richard B. Pilcher and Frank Butler-Jones, B.A., A.I.C., with an introduction by Sir George Beilby, LL.D., F.R.S. 1918. London: Constable & Co., Ltd. Price 3s. net.—These records supply a complete answer to the question: What is the place of the chemist in practical life, and what part has he taken in industrial and social development? The engineer ministers to the comfort and convenience of the community in ways which can hardly escape the notice even of the man in the street. The work of the chemist, on the other hand, is inobvious, and is little, if at all, understood.

The contents of this volume appeared as a series of articles published in *The Engineer* during 1916 and 1917, under the title of "What Industry Owes to Science." The articles were not intended to embrace subjects of common knowledge to the engineer, but dealt mainly with chemical science. For that reason the title of the work has been modified; the text, however, remains practically the same. A bibliography is provided, including many useful books referred to during the preparation of the work. The object of the authors has been to take each industry in turn, and to show by examples how science has advanced the methods and processes of production, and had laid the foundation for the establishment of new manufactures. The work covers a survey of many important industries, and is not out of the depth nor beyond the interest of the educated public. It should be especially useful to students of chemistry and engineering, and will supply teachers of chemistry with abundant material for the purpose of the study of the achievements of science in industry.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVII. No. 4. April, 1918. New York: The Institute.

LIGHTING AND POWER NOTES.

Argentina.—A decree has been issued authorising Messrs. Etchemaite, of Llanos, and Carlos Menendez Behety to install and work electric power installations for lighting, power, and heating in Puerto Deseado, Territory of Santa Cruz, and to utilise public lands situated within the municipal boundaries for the transmission lines. A power station of 200 KW. capacity is to be installed as a commencement.

The maximum prices per KW.-hour which may be charged are:—For the lighting of business premises or private dwelling houses, $0·40 m/n.; schools, hospitals, and public offices, $0·35 m/n.; public lighting subjected to a rebate of 30 per cent.; and electricity for heating, motive power, and other industrial uses, to a rebate of 50 per cent.—*Review of the River Plate.*

The Buenos Aires correspondent of the *Times* stated, under date April 23rd, that "The German Electric Light Co., wearying of the struggle to maintain fuel supplies, is discussing with the municipality terms of handing over the concern and rescinding the concession."

Belfast.—PROPOSED EXTENSION.—At the last meeting of the Corporation, Councillor J. C. White, in moving the minutes of the Electricity Committee, stated that the expenditure for which sanction was applied for to the L.G.B. was about £311,000; an inquiry had been held, which was believed to have been satisfactory. This expenditure would cover the first section of a new and up-to-date generating station at the harbour, which would contain two 6,000-KW. turbo-alternators, with space for a third set of 12,000-KW. capacity, and ample space for future development. The necessity for the Committee's decision was confirmed by the urgent requirements of the shipyards of Messrs. Harland & Wolff and of Messrs. Workman, Clark & Co. To meet the imperative demands, and as the new station could not be completed until the autumn of 1919, one of the 6,000-KW. sets already purchased by the Corporation would be temporarily fixed at East Bridge Street. Particulars of the arrangements which had been entered into with the two firms for a provisional supply of electricity were submitted, and it was stated that on the terms arranged by the Sub-Committee the revenue from these sources would be about £70,000 per annum up to the end of the first year of peace. Negotiations were still in progress with the shipyards as to the terms of supply for a subsequent period of 10 years following the present proposed contracts. A great advantage of the new scheme was that the coal consumption at the new station per unit generated was estimated at 3 lb., instead of 4½ lb. as at present, a saving on an output of 30,000,000 units of 20,000 tons of coal a year. The Committee was awaiting the formal sanction of the L.G.B., and had applied to the Ministry of Munitions for a building licence and a priority certificate for the steel work and plant. Both the Government and the local shipyards had supported the application. The minutes were adopted by the Council.

Blackpool.—FUEL CHARGES.—Mr. Charles Furness, the Corporation electrical engineer, has prepared a return of fuel charges during the 17 years of his management. In 1902 15,289 tons of coal were consumed at a cost of £7,867, with an output of 2,262,516 units. Two years later the 14,869 tons cost £7,302, and 2,570,180 units. Last year the coal consumption was 14,324 tons, costing £13,759—nearly double the price of 1904—and the output was 6,375,398 units. The net profit for the past year is £8,083, or £6,000 more than was estimated; but the surplus for the next 12 months is estimated at £4,000 only. The engineer has received the Committee's instructions to connect the Bispham cables with those of Blackpool, and to dispose of plant which is not wanted at Bispham when the works are closed down. The Bispham installation, which cost about £17,000, was the work of the local District Council prior to amalgamation.

YEAR'S WORKING.—The income of the Corporation electricity undertaking for the past year was £57,941, as compared with £47,035 the previous year. The working expenses were £31,432, and the disposable balance is £8,083, compared with £357 last year.

Bolton.—NEW SHOWROOMS.—The Electricity Committee has accepted the recommendation of the Special Sub-Committee to secure premises in Knowsley Street for the purpose of the electrical fittings department for 10 years, consisting of three shops, workshop, and stores. The electrical fittings department is to be removed from the gas offices.

India.—CORRECTION.—We are informed that the two 5,000-KW. generators at the new generating station at Loyabad are, like the turbines, of British Westinghouse manufacture, not as stated in the ELECTRICAL REVIEW for April 26th.

Leeds.—PROPOSED EXTENSIONS.—The Electricity Committee has recommended the purchase from Messrs. Henry Briggs, Son & Co., Ltd., colliery owners, of a coal wharf and premises adjoining the Corporation electricity works and the river Aire, for the purpose of extensions. The price is £5,500.

Lymington.—PRICE REVISION.—The R.D.C. has been informed that the E.L. Co. is applying to the B. of T. for sanction to increase the price of energy from 7d. to 9d. per unit, with an agreement not to charge more than 8d. The proposal is objected

to by some members, but the chairman expressed the opinion that the offer of the company was a fair compromise, as if they did not agree to 8d. they might have to pay 9d. The question of assenting or objecting has been deferred.

London.—L.C.C.—Loan Sanction.—The Finance Committee recommends the sanction of the Council to the borrowing of £4,000 by the St. Pancras B.C. for a 1,000-kw. motor-converter, &c., and of £6,734 for electricity purposes, mainly for the excess cost owing to war conditions of contracts previously entered into; and of £3,838 by the Woolwich B.C. for linking-up purposes.

Hammersmith.—Plant Extension.—The Electricity Committee has had under consideration the question of the provision of additional boiler-house plant. Tenders have been obtained for the supply of a water-tube boiler having about 8,000 sq. ft. of heating surface for erection alongside the existing boilers, and it has been found that the total cost would amount to approximately £12,000. It is improbable that the work of installing the boiler would be carried out in time for its use during the coming winter. The Committee has, therefore, considered the alternative of installing a larger boiler in the present boiler house with a grate area of 240 sq. ft., and a heating surface of 9,500 sq. ft., which would be capable of driving the largest turbine. This involves the dismantling of three old boilers on which there is an outstanding debt of £2,716, but the Committee anticipates being able to dispose of these boilers at approximately the same figure (the estimated cost of installing the larger boiler), and the Committee recommends that tenders be obtained for the larger boiler, for delivery during the coming winter.

Lynton.—Rationing.—The B. of T. has exempted customers of the E.L. Co. from rationing of electricity on condition that no fuel is used at the works, which are run by water power only.

Newcastle-under-Lyme.—Linking-up.—The Electricity Committee has instructed the electrical engineer to prepare specification of the work required for the purpose of linking-up the Newcastle undertaking with that of Stoke-on-Trent, and to obtain tenders.

Rathmines (Co. Dublin).—Sale of Undertaking.—Notice has been given by Mr. Carruthers at the Urban Council to move the appointment of a Committee to consider the financial position of the electric lighting undertaking and the advisability of disposing of it.

Rochdale.—There was sharp criticism at the meeting of the Town Council on the recommendation of the Electricity Committee to apply the depreciation fund to the liquidation of the accumulated deficit. Councillor Wycherley said the suggestion was dangerous and unsound, and Councillor Shawcross said it was "the most rotten finance possible." Councillor Wycherley said that nothing depreciated more quickly than electricity works plant, and Councillor Lord declared that on a capital outlay of nearly a quarter of a million, a sinking fund of £54,000 and a depreciation fund of less than £10,000, were inadequate. Alderman Clark said that a portion of the machinery had been sold for four times the amount at which it stood in the books. It would be impossible to raid the depreciation fund next year, because there would be nothing in it. Councillor Walker, the chairman of the Committee, said they adopted their policy after taking the best advice. The so-called depreciation fund was created because the Committee had no experience of the life of electricity plant, and they found it did not depreciate so quickly as had been anticipated. The Committee's recommendation was approved.

The T.C. has increased the charges for electricity, as from May 15th, to 50 per cent. on pre-war rates to lighting consumers, without discount, and the rates for power have been again advanced.

Rotherham.—Year's Working.—There is a surplus of £465 on the year's working of the electricity undertaking, after allocating £423 to the tramways renewals fund and £4,672 for loan charges.

Swansea.—Progress Statistics.—At the last meeting of the Electricity Committee, Mr. J. W. Burr, the Corporation electrical engineer, submitted comparative statistics showing the progress of the undertaking in 1916-17 and 1917-18. The total units sold in 1917-18 amounted to 5,956,514, as compared with 4,975,475 in 1916-17. Coal consumption per unit generated, 2·74 lb., 1917-18, as compared with 2·816 lb. in the previous year. The Committee recommended the installation of a small overhead runaway, at a cost of £200, in the boiler house, preparatory to the installing of a coal conveyor at the generating station.

Tavistock.—Workhouse Lighting.—The Board of Guardians, at its annual meeting last week, decided to adopt electric lighting for the workhouse.

TRAMWAY AND RAILWAY NOTES.

Belfast.—Wages.—A curious situation has arisen over the Corporation tramways, a number of the employés having complained to the Irish General Munitions Tribunal that the Corporation had not complied with an award granting an increase of 6s. weekly wages. Mr. Lewis, for the Corporation, explained before the Tribunal on Saturday, that they could not legally carry out the award, their Act of Parliament requiring that expenditure must be kept within revenue. After taxing working expenses to the utmost, and exalting the revenue to the highest possible point, there would be a net annual loss of between £20,000 and £30,000 if the award, which affected 800 men, was complied with. The facts had been placed before the Ministry of Munitions, a Parliamentary Committee had been appointed, and would sit next week, and he was hopeful that a satisfactory solution might be arrived at. Previous increases in wages had placed a burden of nearly £40,000 on the tramways. The hearing was adjourned for a fortnight.—*Daily Telegraph.*

Blackburn.—Service Reduction.—The Corporation Tramways Committee will shortly be compelled to reduce its car service in order to economise. The service would be cut down at a time which would cause the least inconvenience to the public. A statement was made that the profit on the tramways last year was about £5,000. This was not a profit in the true sense of the word, but represented a saving mainly due to the fact that they had not spent money on the permanent way, through inability to get rails.

Blackpool.—Sunday Service.—To assist in economy, the Blackpool Corporation tramways department, Blackpool and Fleetwood Tramways Co., and Blackpool, Lytham, and St. Anne's Tramways Co., for the first time in 20 years, suspended on May 5th their Sunday morning services.

Year's Working.—Mr. Charles Furness, the tramways manager, reports that during the past year the income was £119,339, as compared with £96,224 a year ago, the highest ever reached. Working expenses were £68,456, and the disposable balance £31,518, as compared with £21,182 the previous year. The total number of passengers carried was 20,277,535, as compared with 16,245,022 the previous year.

Bournemouth.—The working of the Corporation tramways last year resulted in a profit of £26,342, after paying £1,193, the deficit on the running of motor-'buses.

Bradford.—Fares Increase.—The Tramways Committee, last week, decided to recommend an all-round increase of 50 per cent. in fares, as from June 1st.

Canada.—The British Columbia Electric Railway Co. has received cable advice that the Parliament of British Columbia has granted full powers to the City of Vancouver to eliminate the Jitney competition, both in the City of Vancouver and between that city and New Westminster.

Women Drivers.—According to the *Times*, the Toronto Street Railway Co. has decided to employ women as conductors and drivers, at the same wages as men.

Cardiff.—Service Congestion.—The manager of the Corporation tramways recently made an appeal to users of the tramcars to do their shopping earlier, in order not to cause congestion at the times when the service is required for business men and workers. According to the *Engineer*, the manager has informed the Corporation Committee that ladies are the chief offenders, and that unless the position improves there would be no alternative but to exclude them from the cars, which would be reserved for people producing authority showing they were on work essential to the interests of the war.

Dublin.—Fares Revision.—The Corporation and the Rathmines Urban Council have asked the United (Electric) Tramway Co. to furnish them with copies of the revised schedule of tramway fares, to which objection has been taken on the ground that, as alleged, it does not conform to the provision of a statute governing fares within a specific boundary.

The Dublin and Lucan Electric Tramway Co. has reduced its Sunday services.

Galway.—Tramway Sale.—The Urban Council is considering a proposal to take over the Galway and Salthill tramway, hitherto worked by a company by horse traction, and also the local electric lighting undertaking. The tramway company has recently been wound up voluntarily, and it is hoped it may be possible to work the system by electricity. The profits from May, 1911 to 1917 were £1,570, and the losses in the same period £1,550.

Halifax.—Service Reduction.—In reply to the B. of T.'s recommendation to tramway authorities to reduce services as much as possible, so as to economise labour and power, the Tramways Committee considers that, in view of the important industries of the town, it is inadvisable to make any further reduction. It is also considered, by a majority of the Committee, that the Sunday afternoon and evening service should be maintained, as the public need the facilities for relaxation.

Huddersfield.—Women Drivers.—The local branch of the Amalgamated Association of Tramway and Vehicle Workers has unanimously passed the following resolution in connection with the training of women as drivers on the local system:—

(a) That in the interests of the department, and for the safety and protection of the travelling public, we enter into a strong protest against the minute of the Tramways Committee—*i.e.*, women drivers—after taking into consideration the local conditions with regard to the heavy gradients that appertain in this locality, and in the interests of women's future health.

(b) That under no consideration are we prepared to undertake the responsibility of training the women as tramcar drivers.

(c) That in the event of the Tramways Committee insisting on the introduction of women as tramcar drivers, we pledge ourselves to use all and every legitimate means to oppose the introduction of females as drivers.

Hyde.—Tramways Purchase.—The report of the Oldham, Ashton, and Hyde Electric Tramway Co. states that in January last the Hyde Corporation gave notice that it intended to exercise its powers to purchase the company's tramways, about 1 mile 5 furlongs, in its area, and negotiations are now proceeding. The other local authorities, in whose areas the remainder of the track, about 6 miles 2 furlongs, is situated, have applied to the Board of Trade and were granted an order extending until February, 1919, the period during which they were entitled to give notice to purchase the company's undertaking within their districts. They have since applied for approval to serve notices of purchase.

Lancashire, Cheshire, and N. Wales Tramways.—The B. of T. Advisory Committee which is dealing with the tramway traffic question in the Lancashire, Cheshire, and N. Wales areas, met in Liverpool last week, with Mr. Mallins, general manager, Liverpool Corporation tramways, in the chair. A Sub-Committee was appointed to inquire as to the cost of each undertaking, with a view to effecting economies in the various services. It is not anticipated that the services in Manchester and Liverpool will be much affected, if at all, in view of the Government work in both cities.

Leeds.—Rate Aid.—The City Council recommends that in future the payments from the tramway undertaking in aid of the rates shall be based on £450 per annum per mile of single tramway track, and £200 per annum per mile of railless route. It was stated that labour alone had accounted for £90,500 more in the accounts this year than in the year before the war, in addition to which £12,000 was being paid this year to dependents of men on war service. All other costs had increased correspondingly, and against this increased cost they could set increased receipts to the extent of £79,000, but that could hardly be expected to be maintained under the restricted service which was to be enforced. Further, during the next five years £80,000 annually ought to be set aside for renewals after the war.

Leicester.—Year's Working.—The annual report of the Corporation tramways for the year ending December 31st, 1917, shows a total revenue of £243,648, an increase of £27,377. The passengers carried were 40,763,811, a decrease of 1,468,827, and the cars ran 3,824,657 miles, a decrease of 283,646 on the previous year. The total receipts averaged 15·289d. per mile, as against 12·634d. last year. There has been an increase in passenger receipts of £15,680 over the year 1916, and the working expenses amounted to £172,583, an increase of £19,629. The gross profits amount to £71,065, against £63,316 last year, and interest, sinking fund, income-tax, bank interest, and war allowance to employés in H.M. Forces, &c., were £61,744, an increase of £427, leaving a net balance to the credit of appropriation account of £9,320. Speaking generally, the permanent way is in good running order, although certain renewals will have to be carried out in the near future. The cost of general repair work and maintenance for the year is £5,639, and in addition £709 has been spent on renewals.

London.—L.U.T.—Commencing May 12th, Sunday cars on the London United Electric Tramways will not begin running until about 2 o'clock in the afternoon.

Fare Revision.—The L.C.C. Highway Committee reports that the estimates for 1918-19 of the working of the Council's tramway undertaking show that the revenue will be insufficient to meet the requirements of the year by £205,290; including the additional charge of £113,000, the increased war wages of employés in the traffic section, but without making provision for renewals, on which the general manager advises that a sum of £125,000 must be spent this year as a matter of urgency, the total additional revenue required to prevent a deficiency is approximately £330,290. Working expenses are estimated for the current financial year at 10·98d. per car-mile (against 8·22d. in 1916-17 and 6·47d. in 1913-14), apart from the payment of war-service allowances of £120,000. The main features of the proposed revision are as follows:—

1. Revision of 1d., 2d., and 3d. Fares.—The average length of the 1d. stage should be reduced from approximately two miles to 1·8 miles. The stages should be divided, as at present in most cases, into three sections. The length of the 2d. stage should be six of such sections and of the 3d. stage nine sections. The maximum fare for a continuous journey on one car should be 4d.
2. Suspension of 1½d. and 2½d. fares.
3. Suspension of ordinary transfer fares.
4. Suspension of children's reduced fares.
5. Revision of Workmen's Fares.—Single tickets to be issued at 1d. for four consecutive sections on one car, and at 2d. for any distance on one car with transfers as now given for 1d. single. Return tickets to be issued at 2d. for a journey in each direction over four consecutive sections on one car; both journeys to be made over the same sections.

Return tickets to be issued at 3d. for any distance on one car, with transfers as now given for 2d. return. The availability of return tickets to remain unaltered.

The present division of the Woolwich route into sections to be retained, so that passengers now paying 2d. would pay 3d. and passengers now paying 4d. would pay 6d.

The average distance that a 1d. single workman passenger could travel would be 2·4 miles, or 4·8 miles for 2d. return.

The revision of fares will afford opportunities of simplifying the ticket system, with resultant savings in working costs and improved fare collection; the economies in working costs and the increased revenue from improved fare collection are estimated to represent about £40,000 a year, or 12 per cent. of the estimated additional requirements for the current year.

The general manager advises that the increased revenue to be anticipated from all sources may be expected to meet the deficiency balance and the cost of renewals in the current financial year, provided that the changes are brought into operation at an early date.

Morley.—Fare Increase.—The T.C., at its meeting last week, expressed surprise that the Leeds City Council intended to increase the tramway fares—which affect Morley—by 50 per cent., and protested against the increase in view of the large profits handed to the Leeds ratepayers by the tramway undertaking. It was further suggested by the resolution that if any alteration were made the distances should be revised.

Oldham.—Year's Working.—There is a net profit of £5,808 on the tramway undertaking for the past year.

Rotherham.—Year's Working.—The total receipts of the Corporation tramways for the year amounted to £83,307. The gross profit was £20,591, as compared with £25,070 for the previous year. The net surplus amounted to £5,633, a decrease of £6,644 as compared with 1916-17.

Salford.—Fare Revision.—In support of an increase in fares, Alderman Linsley stated that early in the year the Council agreed to additional bonuses and increased wages amounting to about £25,000, and during the last three years the expenditure had increased by about £115,000. The increased fares, even if they provided £25,000, would only pay for the recent increase, and the workers were already asking for another advance. The revised scale was approved.

Stoke-on-Trent.—The Council has declined to seal the agreement with the Potteries Electric Traction Co., giving the company a renewal of its tenure of the tramways and light railways in the borough until 1932.

United States.—It is proposed in America to save 1,500,000 tons of coal a year by a "skip-stop" order reducing the number of tramway stopping places by one-third, as a necessary war economy.

The same question has been under consideration by the Tramways (B. of T.) Committee in this country, which is urging that the number of stopping places shall be reduced. This would have an important influence on fuel economy, and would also give a better service in regard to speed and convenience.

Fire.—A fire has destroyed a portion of the power plant of the Great Lakes Power Co. at Sault Ste. Marie, Ontario, with a loss of £3,000.—*The Times.*

TELEGRAPH AND TELEPHONE NOTES.

Germany.—It is announced from Berlin that the Drahtlose Uebersee Verkehr A.G. has been formed there with a share capital of £500,000 for the establishment of a wireless news service, the large station at Nauen being incorporated in the new company. The shares have been taken over by the Gesellschaft für Drahtlose Telegraphie and its associated electrical companies. The directors are Count von Arco, Dr. Franke (Siemens & Halske Co.), bank director Heinemann (Deutsche Bank), Commercial Councillor Mamroth (A.E.G.), and W. Muller (Dresden Bank). Herr Hans Bredow, of Berlin, is the managing engineer. It is not proposed to introduce the company's shares on the Stock Exchange.

In a notice of the German wireless station at Nauen, the pro-German Spanish paper *Industria e Invenciones* states that, whereas in 1914 this station dispatched only some 150,000 words, chiefly to America, in 1915 it forwarded 1,330,000 words; in 1916 it transmitted 2,580,000, and up to September last, the figures reached were 5,680,000 words. The speed of transmission, which at the beginning was only 100 words per minute, attained 250 words at the later dates. As Germany in the latter years was practically cut off from three-quarters of the world, these increased figures, if correct, must refer to Germany's notorious efforts at propaganda by means of the wireless system.

Spain.—The first wireless telegraph and telephone installation on board a Spanish merchant steamer, the *Rey Jaime I*, has just been completed. The system adopted is American, but the plant has been manufactured in Spain. A second steamer, the *Lulio*, is being equipped with a similar plant. The range of the installation is 300 miles for radiotelegraphic purposes, and half this range for radiotelephony. If the trials of radiotelephonic communication between ship and ship prove successful, a land station will be built at Barcelona, which will be linked up with the city and suburban network, and thus afford means of communication between land stations and ships on the high seas.—*Industria e Invenciones.*

CONTRACTS OPEN AND CLOSED.

OPEN.

Australia.—Melbourne.—June 7th. Department of the Navy. Supply and erection of power plant at Garden Island, Sydney. Director of Navy Contracts, Melbourne.

Brisbane.—July 1st. Treasury. Steam-driven turbo-alternators, boilers, and boiler-house equipment for the Inkerman irrigation area near Townsville, N. Queensland. Under-Secretary, the Treasury, Brisbane.

Hoylake and West Kirby.—May 11th. Supply, &c., for one year to March 31st, 1919, of metallic filament lamps. Particulars from R. Williams, Clerk to Council, Town Hall, Hoylake.

London.—Islington.—May 24th. Lighting Committee. 5,000-kw. turbine, alternator, exciter, condensing plant, switchgear, piping, &c., water-tube boiler, coal conveyer, telpher, burners, steam piping, &c. See "Official Notices" April 19th.

H.M. Office of Works. May 10th. Supply of main switches. See "Official Notices" May 3rd.

Redditch.—May 13th. U.D.C. Turbo-alternator, cooling tower, switchgear, water-tube boiler, &c. See "Official Notices," April 26th.

Warrington.—May 22nd. Electricity and Tramways Committee. Motors and transformers. See "Official Notices" May 3rd.

CLOSED.

Manchester.—Electricity Committee. Accepted tenders :

Mather & Platt, Ltd.—One 150-b.h.p., three-phase induction motor and switchgear.

F. Morton & Co., Ltd.—Steelwork required for 20,000-kw. turbo-generator, Stuart Street.

Callender's Cable Co.—Supply and laying of 33,000-volt cables.

Ferranti, Ltd.—Two 3,000-k.v.a., three-phase static transformers for sub-station.

W. T. Glover & Co., Ltd., and Western Electric Co., Ltd.—Supply of cable.

Sheffield.—City Council. Edmund Taylor, Ltd. Excavations and the construction of a concrete and brick tank for oil storage for the electricity department, also the construction of a switchboard for distribution switchgear on the siding at Neepsend at schedule rates ; cost £500.

Spain.—Messrs. Escher, Wyss & Co., of Zurich, have lately secured a contract from the Sociedad Riegos y Fuerza del Ebro for three spiral Francis turbines for its new hydro-electric station near Camaraca in the Pyrenees. The turbines, which are to be of the vertical shaft type, direct coupled to the generators, will each be of 18,000-h.p. capacity when running at a speed of 375 r.p.m.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, May 10th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Ordinary meeting.

London Association of Foremen Engineers.—Saturday, May 11th. At 6 p.m. At the Cannon Street Hotel, E.C. 65th Anniversary Festival.

Junior Institution of Engineers.—Saturday, May 11th. At 3 p.m. At the Holborn Restaurant (Venetian Chamber). Bohemian Concert.

North-Eastern Section.—Tuesday, May 14th. At 7.15 p.m. At the Mining Institute, Neville Street, Newcastle-on-Tyne. Paper on "Stores Organisation," by Mr. E. F. Oakford.

Birmingham and District Electric Club.—Saturday, May 11th. At 7 p.m. At the Swan Hotel, New Street. Paper on "Electric Lifts," by Mr. C. G. A. Macdonald.

Illuminating Engineering Society.—Tuesday, May 14th. At 6.30 p.m. At the Royal Society of Arts, John Street, Adelphi, W.C. Discussion on "The Lighting, Heating, and Power Order (1918), and the Best Methods of Making Economies."

Institution of Electrical Engineers.—**(Students' Section).**—Wednesday, May 15th. At 7 p.m. At Finsbury Technical College, Leonard Street, E.C. Paper on "Electric Railway Traction," by Mr. G. H. Fletcher.

Electrical Power Engineers' Association (Northern Division).—Thursday, May 16th. At the Grosvenor Hotel, Deansgate, Manchester. At 7.30 p.m. General meeting.

NOTES.

The Electrical Contractors' Association.—The *Electrical Contractor* publishes the following report on the work of the Association during 1917 :—"During the year just ended the work of the Electrical Contractors' Association (Incorporated) has been principally confined to dealing with various Government authorities appointed to deal with the general trade of the country. Many interviews have been held with the Department controlling the priority of copper, steel and cables, and the views of members have been clearly set forth in the question of exemptions from the Army, also the views of the Association have been asked for and considered. The Special Committee appointed to report on the electrical trade after the war received two deputations to consider the question of municipal retail trading, and also the suggestion that all electrical contractors dealing in and erecting electrical apparatus requiring more than 25 volts should be registered by some competent authority. With regard to fair trading, a Joint Committee of the various sub-contracting trades was appointed to discuss and draw up clauses in contracts protecting the sub-contractor as against the principal contractor. Many meetings of this Sub-Committee have been held, and reports made from time to time to the Council. The question of apprentices is now being considered by a Committee of the Council, especially that part relating to the return of apprentices after the war. With regard to municipal retail trading, very little under this heading has been done owing to the municipal authorities not being in a position to embark on such work, but, where cases have been reported, they have been dealt with satisfactorily. During the year the membership of the Association has increased by 40 new members, and about 10 firms have resigned, or been struck off, the list."

Volunteer Notes.—London Army Troops Companies' Volunteer Engineers.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Orders for the week ending May 20th, 1918, by Lieut.-Colonel C. B. Clay, V.D., Commanding.

Captain of the Week.—Captain W. Hynam.

Next for Duty.—Capt. W. D. Bentley.

Monday, May 13th.—No. 3 Company, 6.30—8.30. Recruits' Drill, 6.30—8.30. Signalling Section, 6.30—8.30.

Tuesday, May 14th.—Lecture on "Demolitions," 6.30. Physical Drill and Bayonet Fighting, 7.30.

Wednesday, May 15th.—No. 1 Company, Entrenchments, Revetments, &c., 6.30—8.30. Recruits' Drill, 6.30.

Thursday, May 16th.—No. 2 Company, Entrenchments, Revetments, &c., 6—8. Recruits' Drill, 6.30. Signalling Section, 6.30—8.30. Ambulance Section, 6.30—8.30. Band Practice, 7.

Friday, May 17th.—Musketry for the whole Corps, 2.45—4.45.

Saturday, May 18th.—Knotting, Lashing, &c., for the whole Corps, 2.45—4.45. Musketry, 2.45—4.45.

Sunday, May 19th, and Monday, May 20th.—Commandant's Parades at Waterloo Station, 8.45 a.m., for work at Esher. Dress, Marching Order, with rifles. Mid-day and tea rations to be carried.

(By order) Macleod Yearsley, *Capt. and Adjutant.*

Siemens Bros. & Co., Ltd., Reconstitution.—Rumours having been circulated to the effect that the enemy-owned shares in Siemens Bros. & Co., Ltd., had been purchased by the Vickers-Metropolitan-Westinghouse group, a full statement appears in the *Birmingham Daily Post* of May 3rd denying that the report has any foundation, and stating the facts in the following terms :—

"The actual position is that Siemens Bros. has not been sold by the Public Trustee, and is not for sale, but certain shares in the company which before the war were held in Germany, were vested in the Public Trustee, and these only have been sold. After prolonged negotiations, these were recently transferred to a group of English financiers, but not to persons having any connection with the Westinghouse Co. or the Metropolitan or any of the allied companies. The financial group who have bought the shares from the Public Trustee are a syndicate represented by Messrs. C. Birch, Crisp & Co., of London. The Board has been reconstituted, and the directors are now Sir Wm. Bull, M.P. (chairman of J. W. Singer and Sons), Sir Clifford J. Cory, Bart., M.P. (a director of the Barry Railway Co. and chairman of several colliery undertakings), Lord Queenborough (a director of A. Darracq & Co. and other firms), Mr. G. Mure Ritchie (chairman of the Blaenavon Co., Ltd., the Barrow Hematite Steel Co., and others), Mr. J. H. Thomas (stock-broker, Cardiff, a director of upwards of 20 companies), and Mr. G. Chauvin (managing director of Siemens Bros. and director of the West India and Panama Telegraph Co.). Great care has been taken in the sale of the shares that no one should be allowed to purchase who could bring about amalgamation with any other electrical concern, and under the new control the business will remain independent. It was recently stated in the House of Commons by Sir Albert Stanley that no company had been formed for purchasing the shares, and it may be further added that the articles of association are now in such a form that the control of the company can only be vested in British subjects. The Public Trustee required an assurance before the sale that the purchasers would carry on the business as in the past, and this was given. The company was registered in December, 1880, to take over the business of telegraph engineers, &c., of Messrs. Siemens Bros. The capital is £600,000 in fully-paid shares of £5, and there is a 4 per cent. debenture stock (part of £300,000 authorised) for £150,000. Dividends of 7 per cent. were paid in 1914 and 1916, of 6 per cent. in 1915, and 10 per cent. last year."

Electric Power Reform.—The British Empire Producers' Organisation understands that the Board of Trade Committee on Electric Power Supply will shortly present its report, and it is to be hoped that its recommendations will be made public with the least possible delay.

Home-Produced Oil.—Mr. Kellaway, Parliamentary Secretary to the Ministry of Munitions, replying to a question as to the number of modified plants for the distillation of petroleum from cannel coal now in operation at gasworks in Great Britain, and what production had been obtained to date, said it was not desirable in the public interest to give details of production, but it might be stated definitely that gasworks in Great Britain were either now modified or in process of modification to enable all the cannel coal which was known to be available to be carbonised for the production of oil. The process so far had been an unqualified success, and the results were even better than were expected.—*The Times.*

Appointments Vacant.—Assistant shift engineer for Bury (63s. 3d.) ; charge engineer for Norwich ; car-shed superintendent for Dumbarton ; tramway repairs assistant for the Dumbarton Burgh and County Tramways Co., Ltd. ; charge engineer for the Dover Corporation Electricity Department ; engineer-in-charge (£200) for the Sunderland Corporation Electricity Works ; mains assistant (55s.) for Heywood Corporation Electricity and Tramway Departments ; electrical engineer for the Bettws-y-coed U.D.C. electricity undertaking. See our advertisement pages to-day.

Nickel-Copper Steel.—In a paper read by Mr. R. W. Leonard before the Canadian Society of Civil Engineers, particulars are given of an alloy steel made with copper ore mined in the Sudbury district, which contains a substantial proportion of nickel. The process of separating the nickel from the copper involved the waste of great quantities of sulphur and iron ; experiments were, therefore, made by Mr. G. M. Colvocoresses on the production of nickel-copper steel direct from the ores, which, after roasting, were smelted to pig in a Héroult electric furnace and afterwards refined. Immense deposits of the ore are available. It is claimed that the nickel-copper steel gives excellent mechanical test results, and is also less liable to corrosion than nickel steel.

The Metric System.—Suggesting that the last paragraph of our leaderette of last week, on the Metric System, is "just a little abusive and hysterical," an engineering correspondent who has spent many years in countries where the metric system was compulsory points out that those countries "do not manufacture their goods *for sale in this country* to our inches, pounds, or gallons." He goes on: "*I* can MAKE a thing according to English measures and SELL it in French, or German, or Russian. Mind you, *I know* what a useful thing (to me) is the Decimal (and Metric) System; but that isn't the point! I, who have used (and still use) *both* English and metric measures, *do not see the good* of compelling an English workman to use anything but inches and fractions of inches."

We are glad that our critic acknowledges the value of the decimal system to himself; evidently his objection to its adoption is founded not upon a lack of appreciation for its merits, nor upon a sentimental affection for our national peculiarities in this connection, but, with admirable altruism, upon solicitude for the right of the English workman to use inches if he wants to—even though by so doing the workman deprives himself of the advantages which our correspondent admittedly derives from the use of the decimal (and metric) system. In passing, we may say that we believe the average British workman does not care a tinker's dam whether he works to English or metric measures; if he is using jigs or gauges he need not even know the dimensions of the work at all. But the main contention of our correspondent is that, while there is no difficulty whatever in selling goods in metric measures abroad, or English measures in this country, *the goods need not necessarily be manufactured* in metric measures. Quite so; we do not dispute this point for one moment. We are in full agreement with our correspondent on this point, as well as with the promoters of the draft Metric Bill of last year, which contained the following clause:—4. (*a*) "Provided that nothing in this Act shall affect the manufacture or use of any machinery, tool, pattern, sieve, template, or other article made by measures other than metric measures." As we pointed out on page 295 of our issue of March 16th, 1917, this means that while all buying and selling would have to be done in metric quantities, our existing weights and measures would continue to be used for manufacturing purposes by those who chose to use them. The point was further explained in our issue of March 23rd, 1917, page 314, and elsewhere from time to time.

It is quite a good plan to ascertain the facts before passing sentence on the accused.

Fuel Economies.—At the two days' session of the Canadian Society of Civil Engineers, held at Toronto a few days ago, the part to be played by electricity in solving Canada's fuel problem occupied a large proportion of the time. After dealing with the possibility of United States coal supplies being cut off, Mr. William Challis declared that the electrification of railways, especially terminals, with adjacent engine divisions, would save an enormous consumption of bituminous coal, and relieve the transportation system. Something like 9,000,000 tons of coal was consumed by the railroads in 1917; it would be possible to save two-thirds, at least, of this coal by the use of electric locomotives. The present *per capita* hydro-electric power development in Canada is larger than that of any other country except Norway. Mr. J. M. Robertson, of the Southern Canada Power Co., Montreal, in a paper on the possibilities of the relief of fuel consumption in Canadian industry by the increased use of hydro-electric energy, mentioned that Toronto's use of electricity was practically that of Montreal, and both these cities stood in the forefront of the great cities of North America in this respect. Mr. P. H. Mitchell declared that the present development of electric power did not render practicable the use of electricity as a heating agent. But with a possible population of 25,000,000 in 1969, with a population of 15,000,000 in the coal area of central Canada, the exhaustion of other sources and increasing prices would compel the adoption of electricity for heating purposes. Mr. John Murphy, chief electrical engineer of the Department of Railways and Canals, Ottawa, in a paper on "Railway Electrification," gave a number of concrete instances to show where the electrification of railways in mountain sections had increased their efficiency. Prof. Peter Gillespie, School of Practical Science, said that 2 million H.P. would be required to heat electrically Toronto's buildings, housing a population of 500,000 people!

Answering questions in the House of Commons on Tuesday last, Sir A. Stanley stated that steps were being taken to ensure that all coke produced should be used, and that corresponding economies should be effected throughout the country in the consumption of coal. He was considering whether in rationing coal it might not be practicable to take into account the consumption of gas for heating and cooking purposes, but must warn householders that, whether their fuel was in the form of coal or gas, a very material reduction in consumption was absolutely necessary.

Hastings Linking-up Scheme.—Mr. Russell Ferguson, the Hastings borough electrical engineer, has had under consideration for some time a scheme for the centralisation of electricity supplies within a radius of 12 or 15 miles of the town. Last June he submitted to the Board of Trade, with the consent of his Committee, a full statement as to his proposals, which are that the Board of Trade should give the Hastings Corporation power to supply the area extending halfway to Eastbourne, and about the same distance from Maidstone. This area could be supplied from a bulk supply power station put down at the west end of the Borough of Hastings, alongside of the L.B. & S.C. Railway, on ground partly belonging to the Corporation, close to the sea, thus having available an unlimited supply of water for condensing purposes. This would give a bulk supply to Bexhill, the Hastings and District Tramways Co., and also the Hastings generating station, which would be turned into the principal distributing station for the area. If any of the small places round about wished for a supply of electricity, the supply could be taken overhead to static transformer sub-stations, and distributed from there. The plant proposed to be put down would have a standard voltage of 3,300 or multiples, 50 periods, three-phase. Should super-bulk supply works be erected at some future time, say, for instance, at the Kent coalfields, to supply all the South-Eastern district, Hastings would be able to take the supply from them and distribute it in the area already referred to. The great bulk of the house coal used in Hastings, St. Leonards, and Bexhill could be brought close to the proposed site for the new works, and treated at a low temperature, recovering the gas and residuals, the gas being used for generating steam at the new power works; the partly-coked coal could be sold at a much cheaper rate to the ratepayers, by this means doing away with smoke. The residuals would not be wasted, as they are at the present time.

Electrical Power Engineers' Association.—We are informed that there has recently been a large influx to the above Association of engineers engaged with electrical manufacturers throughout England. A desire has been expressed that they should have opportunities for meeting further than are meanwhile offered, and to this end there was successfully inaugurated last week the East London Manufacturing Section of the E.P.E.A. There was a large attendance of members of the technical staffs of electrical engineering firms in that district. Mr. G. F. Dewynter was elected chairman and Mr. E. Barnard honorary secretary, with a Committee of four. This section will be represented on the Divisional Council by its honorary secretary. Similar sections in other areas are in prospect, and one will shortly be formed at Hayes. It is believed that this branch of the Association's activities will in the near future become strong and influential. Membership is open to all qualified engineers engaged on power plants or with electrical manufacturing and contracting firms.

Scientific Congress.—The annual congress of the South-Eastern Union of Scientific Societies will be held in London on May 29th—June 1st. The hon. secretary is Mr. H. N. Gray, 334, Commercial Road, E. 1.

Institution and Lecture Notes.—Institution of Civil Engineers.—At the annual general meeting, on April 23rd, the result of the ballot for the election of officers for the year 1918-19 was declared as follows:—President, Sir John A. F. Aspinall; vice-presidents, Sir John P. Griffith, Mr. John A. Brodie, Mr. W. B. Worthington, and Dr. W. H. Maw. Other Members of Council included Sir Dugald Clerk, Col. R. E. B. Crompton, Sir Archibald Denny, Sir Robert A. Hadfield, Mr. Summers Hunter, Mr. Basil Mott, Vice-Admiral Sir Henry J. Oram, Capt. H. Riall Sankey, and Sir John F. C. Snell.

Association of Mining Electrical Engineers.—At a meeting of the Yorkshire Branch of the Association, at Wakefield, the question of increasing the coal output was discussed in relation to the provision of efficient signalling apparatus. A paper, by Mr. W. de M. Landon, A.M.I.E.E., described an interrupter system, with relays, which could be worked with a single wire, and which the author claimed to be positive in action, inexpensive, simple and efficient, and perfectly safe, inasmuch as it worked on a 6-volt circuit. The system is in operation in a number of Lancashire collieries. The important bearing that quick and efficient signalling, especially in connection with haulage, has on making possible the more rapid handling of coal, and, consequently, on increasing output, was emphasised.—*Sheffield Telegraph.*

The West of Scotland Branch has elected Mr. A. Smellie as president and Mr. D. Landale Frew secretary. On Saturday last the following papers were to be read:—"Organisation of Electrical Repairs," by Mr. J. McCann, and "Electrical Breakdowns and their Cause," by Mr. F. A. Hale.

Junior Institution of Engineers.—"The Electric Furnace" was the subject of a lecture given by Mr. Verdon O. Cutts before the Sheffield and District Section of the Institution. Several applications of electrical furnaces of particular interest to Sheffield were reviewed by Mr. Cutts, the chief being the manufacture of steel from scrap. He also dealt with the manufacture of ferro-alloys, and with furnaces for non-ferrous metals and alloys, and for hardening, tempering, forging, annnealing, and heat treatment. The details given were based on the lecturer's personal experiences during the war.—*Sheffield Telegraph.*

Institution of Electrical Engineers.—At a meeting of the NEWCASTLE LOCAL SECTION, on the 6th inst., Mr. H. W. Clothier presiding, an informal discussion was held upon the Ship Electrical Equipment Committee's draft regulations.

Royal Marine Engineers.—The Secretary of the Institution of Civil Engineers is informed that the Admiralty are open to receive applications from gentlemen for commissions as Lieutenants in the Royal Marine Engineers. This branch of the Royal Marine Corps has been formed with a view to the rapid execution of constructional engineering work. Candidates should have previous practical experience on civil engineering works, and be capable of setting out work and controlling men. Candidates up to 50 years of age will be considered, but those under 35 should have a lower medical category than Grade 1. Pay and allowances will be at the rate authorised for the Royal Engineers, and the usual outfit allowance will be granted. Applications, with copies of testimonials, and particulars of experience, should be addressed to the Adjutant General, Royal Marines, Admiralty, S.W. 1.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station and Tramway Officials.—The Controller of Coal Mines, having asked Blackburn Corporation to nominate a qualified person to undertake the work of inspection of various works and factories in this locality in connection with the economy in coal consumption, the Town Council has authorised Mr. P. P. WHEELWRIGHT, the borough electrical engineer, to act in this capacity.

The Dublin Corporation has appointed Mr. B. MUNTZ consumers' installation engineer in room of the late Mr. Edward, with Mr. L. O'Connor as assistant.

The Admiralty has acceded to the request of the Doncaster Electric and Tramways Committee for the release of Mr. E. S. RAYNOR to resume his duties as electrical and tramways manager, at £550 per annum. Mr. POTTS was complimented on the way in which he had "carried on" in the department in the absence of the manager.

Bingley District Council has advanced the salary of its electrical engineer, Mr. F. L. PEDLEY, from £185 to £190, and the salaries of other official on a similar generous scale.

Mr. F. H. HITCH, engineer-in-charge at the Hammersmith B.C. electricity works, has resigned, having obtained an appointment with the National Boiler & Insurance Co. Since the meter superintendent, Mr. Ashton, resigned last November, it has not been possible to secure a successor of non-military age. Mr. W. Cook, the canvasser, took over the work in the meter department, and this arrangement is to be continued until the return of the permanent meter superintendent, Mr. W. H. R. Watts, who is on military service. Some of Mr. Cook's work will be done by Mr. J. Day, who has been acting as mains superintendent. The salaries of Messrs. Cook and Day, including war allowances, are now raised to £5 5*s.* per week each.

General.—Mr. H. COBDEN TURNER, of the British Westinghouse Electrical & Manufacturing Co., Ltd., has been appointed manager of Salford Electrical Instruments, Ltd.

Messrs. Electro-Bleach & By-Products, Ltd., announce that Mr. ROBERT E. MOYNIHAN has left their employ.

Roll of Honour.—We are sure that all of our readers will desire to join with us in expressing deep sympathy with Sir Charles and Lady Parsons in the loss they have sustained by the death of their only son, Major ALGERNON GEORGE PARSONS, R.F.A., who was killed in France on April 26th, aged 32 years. Major Parsons was a director of the Parsons Marine Steam Turbine Works, Ltd., and of Messrs. C. A. Parsons & Co.

The *Times*, in announcing the death of Captain G. TREVOR WILLIAMS, R.F.A., aged 30, through an accident, states that after leaving Armstrong College, Newcastle-on-Tyne, he had two years' practical experience in the electrical works of Messrs. Chas. A. Parsons & Co., whence he proceeded to Trinity College, Cambridge, for a course of research work, and was associated with Prof. Hopkinson in a paper read before the Royal Society. From Cambridge he was appointed to an important post with Messrs. Chance Bros., Birmingham, and was with them when war broke out.

Private J. STANDISH, Middlesex Regiment, formerly on the staff of the Burslem electricity works, has died on active service.

Lance-Corporal MYNETT, South Staffs. Regiment, reported missing, was on the staff at the B.T.H. Works.

Sergeant R. C. WILLIAMS, who was on the staff of Mr. J. B. Saunders, electrical engineering contractor to the Cambrian Railway Co., Welshpool, is a prisoner of war at Cassel, Germany.

Sergeant W. H. ATKIN, M.M., R.E., who has fallen in action, was an electrician with Messrs. Bolckow, Vaughan and Co., Ltd., Middlesbrough.

The Military Medal for gallantry in action has been awarded to Bombardier G. PITT, who was with the Bath Electric Tramway Co.

Rifleman C. H. DODIMEAD, of the 16th Battalion Rifle Brigade, only son of Mr. C. E. Dodimead, of Messrs. J. Dodimead & Son, who has been missing since the German advance of March 21st, is a prisoner in Germany. He has been in France since November, 1916, and has twice been in hospital, from shrapnel wound and trench fever.

Private R. STANDISH, L.N.L. Regiment, killed in action, was employed at Bolton Corporation electricity works.

The death in action is presumed, after being reported missing since July last, of Private J. SMITH, Cheshire Regiment, aged 24 years, who was employed by Messrs. Dick, Kerr and Co., of Preston.

Lieutenant GEORGE PROCTOR, Lancashire Fusiliers, killed in action, was apprenticed with Messrs. Rushworth, electrical engineers, of Colne.

The Military Medal has been awarded to Lance-Corporal E. HOLWAY, R.M.L.I., who was on the electrical staff of the Theatre Royal, Halifax.

Private J. MARRIOTT, R.A.M.C., who has been gassed, was with Messrs. J. W. & R. Graham, electricians, Huddersfield.

Lance-Corporal W. G. SHUTTLEWORTH, missing since March 27th, was with the Keighley Electrical Co.

Second-Lieutenant J. J. FAWCETT, Royal Inniskilling Fusiliers, missing, believed killed, was an electrical engineer with Mr. J. W. Buchanan, Londonderry.

The Military Medal has been awarded to Sapper E. O. WEBBER, Signal Section, R.N.D., who was in the Hull Corporation electricity department.

Corporal G. PAGE, M.M., killed in action, was employed by the electricity department of the Keighley Corporation. He was awarded the M.M. six weeks ago.

Lieutenant GEORGE PROCTOR, Lancashire Fusiliers, killed in action, aged 25 years, was with Messrs. Rushworth Bros., Ltd., electrical engineers, Colne.

Corporal W. CLOUGH, R.F.A., who has been awarded the Military Medal, was formerly employed by the Tudor Accumulator Co., Ltd.

Obituary.—MR. JAMES W. ROOK.—Mr. Rook, whose death we announced in our last issue, was very widely known and highly respected in the commercial electrical world. From the late eighties of last century to the year 1899 he was with Messrs. Crompton & Co., Ltd., at Chelmsford. He was in position of considerable responsibility in connection with the stores and purchasing department, and was commercial manager at Chelmsford when, in 1899, he joined the Sloan Electrical Co., Ltd., in London. With the latter firm he has been prominently identified from that date right down to his death, which took place suddenly on May 2nd at his residence at Southgate. Mr. Rook was a man of strong personality, and of qualities and abilities which were appreciated in electrical trade circles in the City of London. He devoted his attention chiefly to the carbon and lamp sections of the industry. He was 61 years of age.

CITY NOTES.

British Westinghouse Electric and Manufacturing Co., Ltd.

The annual meeting was held on Monday at Hamilton House. Mr. J. ANNAN BRYCE, M.P., who presided, having referred to the principal figures in the balance sheet, turned to the profit and loss account. He said that the profit available for the year was £194,403, which compared with £311,199 in 1916, a falling off of £116,796, while the net profit of £88,124 compared with £199,346 in 1916, showing a decrease of £111,222. This result was due in part to the conditions in Russia, which had made it necessary to provide a considerable sum in respect of outstandings in that country. Moreover, it had been thought prudent to provide considerable sums for development and research work. In the future it would be necessary for them to devote large amounts of money to those purposes if they were not to fall behind in the race. In no industry were changes more rapid and more numerous than in their trade, and every day developments, requiring the expenditure of large funds in research and experiment, were taking place. In view of the keen competition which was before them after the war, it would be essential for them to keep abreast of the times, and he was afraid that they might have to look forward to the expenditure necessary having an appreciable effect on the extent of the profits. To return to the question of the diminished profit of the year 1917, the main causes had been those which he had been foreshadowing in his speeches since the war began, and the cumulative effect of which had become more marked as time went on. The labour position had become steadily worse. Not only was it exceedingly difficult to obtain labour at all, but that which they did get was not so efficient, while the cost of it had risen immensely. The difficulties, which had been particularly acute in 1917, seemed likely to continue. Since May of last year there had been a constant drain on their labour resources through the combing-out of semi-skilled and unskilled labour under the scheme of the Ministry of Munitions. Further depletions had been caused by the recall to the Colours of men returned from the Army for munition work, and they expected that their shops would be still further denuded by the calls of the military authorities under the revised schedule of protected occupations and under the Man-Power Act. Great difficulty was experienced in making good those losses owing to the all-round shortage of labour of the class required. Every possible effort had been, and was being, made to fill the gaps by discharged soldiers, but that source of supply did not furnish nearly enough men accustomed to their class of work. The difficulties might be gathered from the fact that since January 1st, 1917, to April 26th, 1918, there were engaged 2,931 men and 2,506 women. The cost of male labour was now 66 per cent., and that of female labour 100 per cent., above the cost of 1913, and these figures applied in the case of both sexes to the earnings of persons under 21 years, as well as to those of persons above that age. Then there had been continual and increasing difficulties in obtaining raw materials, even at the greatly enhanced prices which had been ruling. Many of those materials came from abroad, and, owing to tonnage difficulties, almost all of them were now under Government control, and had to be doled out often after long delays. Moreover, their work depended to a considerable extent on supplies of material from other manufacturers, who in many cases, labouring under similar Government restrictions, had been unable to keep deliveries at due date, with a resulting delay to, and increased cost of, the work in their own shops. The effect of all those adverse

factors had been that completion of orders had had to be suspended and deliveries postponed, with the result that in many cases the estimates of cost had proved to be inadequate. Another cause adversely affecting profits had been the fact that a considerable part of their business had been Government work, in which margins were cut very fine. He hoped they might do better in the future. They had an excellent staff, who had met the unprecedented difficulties of their task with devotion and loyalty. After the war there would in their trade at least be an immense field for expansion, for not only would a great part of the world require reconstruction, but the experience and necessities of the war had shown that in this country one of the main elements of economy in its resources would be the development of electric power from large central stations. The report of one of the Government Reconstruction Committees estimated that 100 millions of pounds might be saved annually by the creation of such central stations. For such work they were well laid out. Until shipping restrictions began to impede their business, they were building up a good continental and export trade, and though it was suffering at present, it was to be hoped that it might recover and extend after the war, at least in the Oversea Dominions and Allied countries, where German manufactures would probably not be in so great favour as formerly. But there was no use disguising the fact that difficulties would be great. He had already spoken of the way in which expenditure on development and research might affect their profits, but there would be severe competition from America as well as Germany. The country would labour under an immense load of debt which could only be met by increased production, and increased production could only be secured by Labour and Capital uniting for a long pull, a strong pull, and a pull altogether. Excellent work in this direction was being done by the Works Committee, which was started in January, 1917. It had co-operated splendidly with the management, and on its advice, and with its assistance, many ameliorations had been effected in the conditions in the shops, and many difficulties with the workmen amicably settled. The operations of the Committee had produced a more harmonious feeling between the workers and the management, and, in view of the increased spirit of trust and mutual respect, the management looked forward with confidence to the assistance of the Committee in the handling of the difficult problems likely to be presented by demobilisation. Numerous inquiries had been received from large industrial concerns throughout the country for information about the constitution and operation of their Works Committee. At the last meeting he described to them their educational system, which, under the guidance of Mr. Fleming, had attained great success, and excited the attention of Mr. Fisher, the Minister of Education, as well as interest all over the country. That system continued in operation with the same success. Under the present conditions of military service they were losing at the age of 18 many of their potential engineers, but they might console themselves with the conviction that the training received at the works would, if the authorities had any intelligence, be of great service to the Army. Special classes were being run for women with the object of training them for real draughting work—many of them were already carrying out design work—and they expected that by this means the loss of their young draughtsmen would be made good. Much good research work had been accomplished during the year. The scope of the department had been considerably increased, and the equipment and personnel enlarged and strengthened. There was now under consideration a comprehensive scheme in connection with research and development, which were of essential importance to their success in the future. After referring to the position of the Employés' War Relief Fund, Mr. Bryce said that up to the present time there had joined His Majesty's Forces 3,206 of their men, of whom 233 had fallen. In connection with the entry of the new financial interests, changes in the board became necessary. Mr. Lang and Mr. Blunt had retired from the board, but their services were still at its disposal. To Mr. Lang, who had been in the service of the company since 1906, as works manager from July, 1906, to September, 1909, then as a director and managing director of works from September, 1909, to August, 1913, and as managing director from August, 1913, to February, 1918, had been very largely due the high position of the company. Through having obtained the confidence of the workers, they had all through his administration been able to avoid serious labour troubles, and his reputation for fairness had led to his being often asked to arbitrate in outside disputes. It was largely through his help that the company was able to pull through its dark days. The directors were glad that they had been able to retain at their disposal his great technical abilities. Mr. Blunt had been with the company since the start, and his great capacity as a sales manager had been of the highest value to them. He was happy to say that in his case, also, his abilities would remain at the service of the company. Three gentlemen had joined the board representing the new financial interests, viz., Sir Ernest V. Hiley, K.B.E., and Mr. Lincoln Chandler, of the Metropolitan Carriage, Wagon and Finance Co., Ltd. (the latter one of its managing directors), and Sir Francis H. Barker, of Messrs. Vickers, Ltd. The two former gentlemen had been elected by the board vice-chairman and managing director respectively. The abilities of all three gentlemen were well known in the industrial world, and he was confident that with their experience, and the support of the powerful concerns they represented, a great future was in store for the company.

Sir Ernest V. Hiley, in seconding the adoption of the report, said that as that was the first year the company had been free from American control he felt impelled to say a few words. There was no use disguising the fact that the results of the past year's trading had been distinctly disappointing. The chairman had alluded to the causes, but the fact remained that the net available profit was more than £111,000 less than it was at the end of 1916. When the representatives of the Metropolitan Carriage, &c., Co. and Messrs. Vickers took their seats on the board the results of the trading up to that time were very unpromising, and they created a feeling of uneasiness, which had not yet altogether disappeared, though, he was glad to say, there had been a welcome improvement in the recent returns—particularly in those for January and February of this year. He thought the board would have been justified in paying a less dividend than 7½ per cent., because to do so they had had to reduce the carry-forward to £51,000, which was little more than half of the amount brought forward. As to the future, they found that in the past it had been the practice to rely largely upon America for designs and improvements in apparatus. In the national interests they could not afford to do that any longer. That company was now British-owned, and it must stand on its own feet, and they intended to build up the business until it could take its place amongst the foremost industries of the world. Electrical enterprise had been too long in the hands of other nations. The chairman had already alluded to the keen competition they must expect from the Germans after the war. To cope with that they must be thoroughly up to date, and to that end the directors had decided to develop the department of research and scientific study. They found that the insufficiency of that department was a blot on the whole organisation of the company. Not only did it affect the English company, but the want of it was felt in the subsidiary companies in France and Italy. They could not create that department in a day, it must be built up gradually; but to make it effective the company must be prepared to spend money in no niggardly spirit, and he felt sure the shareholders would not grudge the necessary expense. In regard to the question of capital expenditure, last year they were warned that the board could foresee the necessity for increased capital expenditure, not only for that company, but for the subsidiary companies. When the capital of the foreign companies was increased it would be absolutely necessary for them to take up their proper proportion, as otherwise they would lose their voting control, and upon the maintenance of that control depended the whole organisation of the enterprise. The sums required would be large, and he was inclined to believe they could only be obtained from the ordinary shareholders. At the present time the capital of the company was very badly balanced. The preference shareholders greatly predominated, and there were two series of debentures already in existence. It would be undesirable to issue a third series, while the fact that the preference shareholders were entitled to a maximum dividend of 15 per cent. before the ordinary shareholders participated created a great difficulty with regard to the capital. Speaking as a representative of a majority of both classes of shareholders, he had no hesitation in saying that the capital needed redistributing. It was doubtful if a 15 per cent. dividend would ever be paid on the preference shares—indeed, it seemed quite possible that the present 7½ per cent. would not be maintained—and should it be necessary to raise money on mortgage or on debentures the interests of the preference shareholders would, of course, be postponed in favour of the new charge. To avoid that they would have to issue additional ordinary capital, but what would be the prospect of success if there were a large body of 15 per cent. preference shareholders in front of the ordinary, who had never yet received a penny in dividend? The holders of the majority of the preference shares were ready to face the position, and would agree to a curtailment of their privileges in the interests of the company. They had embarked a great deal of money in the enterprise which they did not want to lose, but it was largely on national grounds that they bought out the American interests. Having made the company a British concern in both ownership and management, they wanted it to succeed, and they felt quite sure that in that endeavour they would have the support of all shareholders. A scheme for a redistribution of the capital was in preparation, and as soon as it was ready it would be placed before the shareholders at a special meeting.

Mr. H. W. Birks remarked that such drastic proposals as those foreshadowed by the last speaker gave grave grounds for complaint that no mention was made of the subject in the report. The preference shareholders had already sacrificed £3 a share of their capital, and he believed that any scheme to further reduce the shares would meet with serious opposition.

The report was adopted.

Indo-European Telegraph Co., Ltd.

Mr. J. H. Tritton, presiding at the annual meeting on April 30th, said that the final figures for the year 1917 would be circulated as soon as they were available. The meeting approved a resolution declaring a final dividend of 22s. 6d., free of tax, making 7

per cent. for the year, with a distribution from equalisation of dividends fund of 30s. per share, subject to the terms of the Trading with the Enemy Proclamations. Mr. Tritton said that the arrangement come to with the Eastern Telegraph Co. and the Indo-European Telegraph Department of the Indian Government had applied to the whole of the year, whereas last year it covered only the last five months. Under that arrangement, those two telegraph administrations secured to this company a sufficient revenue to cover all working expenses and to pay a dividend of 7 per cent. upon the share capital of the company. The company's revenue from telegraph traffic was now comparatively small, and after adding to this the interest upon investments, there still remained a considerable sum of money which had been found by the administrations just referred to, and the company was deeply sensible of this generous treatment. He informed the shareholders at the last general meeting that it would lie with the directors to recommend any additional dividend by drawing upon the fund established for the equalisation of dividends. The directors had given this question their earnest consideration, and had decided to recommend that the total distribution for the year be brought up to the same level as in previous years by withdrawing £25,500 from the equalisation of dividends fund. The shareholders had some claim upon this fund, which was established during a series of prosperous years for this very purpose; these were hard times, and the directors were loth to reduce the dividend at a time when, in all probability, it was more urgently needed. He was unable to make any statement as to their wireless interest; the negotiations that were initiated last year were not yet concluded. The company's route remained interrupted between this country and Russia, and they were now having a good deal of trouble south of the Caucasus, owing to the unsettled state of the country lying between Tiflis and the Russo-Persian frontier. Their further plans must, of necessity, remain undecided until the war was over. The company completed 50 years of public service on April 8th, and they fully hoped and believed that once the war was over they would be able to re-establish telegraphic communication, and that the company would once more become a useful and active entity.

Nitrogen Products & Carbide Co., Ltd.—Final dividend 3 per cent., less tax, making 6 per cent. for the year. The Odda factory has worked satisfactorily, but production has been occasionally restricted owing to the difficulty of keeping stocks of raw material at the maximum under prevailing war conditions. The output was disposed of under agreements, which have expired, but fresh contracts have been entered into, which ensure the sale, at a remunerative price, of all cyanamide that can be manufactured during 1918. The Swedish works continue to give good results, and the demand for both carbide and cyanamide from that factory has been well maintained. Latest reports regarding the works for the production of nitric acid by the catalytic process state that the licensees are so satisfied with the process that further plants are being erected.

River Plate Electricity Co., Ltd.—In their report for 1917 the directors state that owing to practically all fuel tonnage between the United States and the Argentine having been commandeered, deliveries of oil fuel under the company's contract have been suspended since the commencement of the present year. In consequence the company is compelled to purchase any fuel obtainable in the market at the prevailing famine prices. The effect upon the current year's trading cannot fail to be most serious. No interest has been received upon the 5 per cent. obligations of the German Trans-Oceanic Electric Co.

North of Scotland Electric Light & Power Co., Ltd.—The working during 1917 showed a satisfactory result considering the conditions. Montrose connections increased from 1,091 KW. to 1,173 KW., Brechin from 815 to 837 KW., and Inverness from 1,597 to 1,784 KW., making a total of 3,794 KW. connected in the three towns. The gross profit was £6,642, against £7,550 for 1916. After deducting debenture and loan interest £2,620, and adding £2,177 brought forward, the net profit is £6,200. A dividend of 3 per cent. for the year is to be paid, £2,000 is to be placed to renewal reserve, £1,000 to general reserve, and £1,700 is to be carried forward.

Altrincham Electric Supply, Ltd.—During 1917, 33 new installations were connected. The profit was £6,536, plus £502 brought forward. After paying the preference dividend, putting £1,000 to reserve for income-tax, and £1,500 to depreciation of plant reserve, a dividend of 3s. 6d. per share was paid on the deferred shares. £5,000 debentures and £5,000 preference capital have been issued for plant and mains additions already carried out and for general purposes. We referred to the annual meeting in our last issue.

Companies Struck Off.—The following have been struck off the register and are dissolved:—

Bleicher's Aerial Transporters, Ltd.
British Graetzin Light, Ltd.
Eclipse Electric Sign Co., Ltd.
Magneto & Taximeter Co., Ltd.

Chiswick Electricity Supply Corporation, Ltd.—For 1917 the revenue was £31,143, against £20,523. The directors recommend a dividend on shares of 6 per cent., less tax, placing £1,400 to depreciation reserve fund account, and carrying forward £1,008.

Craigpark Electric Cable Co., Ltd.—Net profit for the year ended March, 1918, after providing for excess profits tax, £11,297, plus £716 brought forward. There is to be appropriated to depreciation off buildings and machinery £2,000, and to be put to reserve £3,000, 6 per cent. on the preference shares absorbs £2,850, and 6 per cent. on the ordinary £2,250, leaving £1,913 to carry forward, subject to directors' fees. The volume of business has been satisfactory, although production has been handicapped by shortage of labour and scarcity of materials.

Anglo-American Telegraph Co., Ltd.—The dividends on the ordinary preferred and deferred stocks for 1917 absorbed altogether £262,500, being the rent paid by the Western Union Telegraph Co. for the year, equal to 3¾ per cent. on the ordinary stock, 6 per cent. on the preferred stock, and 1½ per cent. on the deferred stock. The balance at credit of revenue account, £71,428, includes £5,803 interest received, and the balance of £65,625 is available for the payment of March quarterly dividends.

British Ever-Ready Co., Ltd.—Final dividend on the preference shares at the rate of 10 per cent. per annum for the half-year to March 31st, making the maximum of 10 per cent. for the year. Final dividend on the ordinary shares at the rate of 10 per cent. per annum for the half-year, plus a bonus of 7½ per cent., making 17½ per cent. for the year.

Montreal Light, Heat & Power Co.—Dividend, 2 per cent. for the quarter to April 30th.

STOCKS AND SHARES.

TUESDAY EVENING.

STOCK EXCHANGE markets have shown a fair amount of buoyancy during the past few days. There is more business going on, and a greater excess of confidence has developed by reason of the news from the Western Front. With the general improvement in the prices of gilt-edged securities, including the debenture stocks of the home railway companies, there has also come a revival of interest in the more speculative stocks and shares. Almost the only market which is dull for the time being is that for rubber shares, where the companies have troubles peculiar to themselves. So far as other industrials are concerned, the retention of the Excess Profits Tax at its previous level is still held as a bull point, and has encouraged appetite for high-yielding issues. A sharp recovery in home railway ordinary stocks is another feature of the markets.

The principal advances secured by the stocks and shares quoted in our lists are those in the British Columbia Electric Railway descriptions. The four principal issues have gained 4 to 8 points apiece, thanks to the announcement that the British Columbia Parliament has granted full powers to the City of Vancouver to eliminate the jitney (motor-car) competition both in the City of Vancouver, and between that city and New Westminster. This has removed the factor which occasioned more anxiety than anything else in the minds of the British Columbia stockholders, and, as we have remarked lately, private advices from Vancouver speak hopefully of the greatly improved conditions that have latterly obtained in that city, and in the province as a whole with regard to general business.

Brazilian Tractions are also a better market, though the improvement in their case is limited to a point. Mexican and Anglo-Argentine shares and bonds remain on the heavy side, though there seems to be rather more disposition to look at Mexico Tramways bonds. The Argentine Tramways and Power Co. (which must not be confused with the Anglo-Argentine Tramways) publishes a progressive report showing that the net revenue for last year came to £15,000, an improvement of £1,600 as compared with the previous 12 months. The debenture interest is paid, but the preference shares still go without their dividend, which is now 18 per cent. in arrears. Georgia Light & Power common have weakened to 12½, although the annual report gives the net profits for 1917 as $117,600, an improvement of $30,000 over the 1916 figures.

The home railway market, as noted above, stands out with a good many rises. The Undergrounds are a better market, though they have not yet participated to any extent in the improvement which has occurred amongst the steam lines stocks. Underground Electric Income bonds have risen 1 to 75. Metropolitan gained ¼, and Districts keep steady, both being somewhat better than they look.

That the transport business of London is not all honey is shown by the annual reports issued by the London United Tramways and the Metropolitan Electric Tramways. The London United Tramways accounts show a loss of £9,000 for last year, as against £2,600 in the previous 12 months. The preference dividend is nearly 45 per cent. behindhand. The only hope of salvation would appear to be in a drastic reconstruction of the capital, and reorganisation, unless thrown out in Parliament, will probably be agreed upon. The Metropolitan Electric Tramways has done better, but the preference shares get only 2 per cent., instead of the 5 per cent. which they received a year ago. The preference shares last changed hands at 5s. at the end of April. London United Tramways debenture stock stands at 40, the last recorded

bargain in the Stock Exchange Official List being at 38½ on April 4th, over a month ago. Raising of fares on the L.C.C. system would probably be followed by the same step on the L.U.T. and the M.E.T. cars, and this is regarded as being almost a certainty.

Cuba Submarine ordinary have risen to their par price of 10, and Oriental Telephones are 1/16 better at 4¼. With the exception of these, and a rise of ¼ in Anglo-American Telegraph preferred, no particular change has occurred in this section. Marconis are keeping steady at 3½. American Marconis hardened to 23s. The Globe issues are firm. Nor is there any particular change in the prices of manufacturing shares. General Electric preference at 10½ are ¼ lower, while amongst the electrical manufacturing issues, Electric Constructions at 1½ are ¼ down. British Westinghouse preference recovered further to 2⅝, to react later to 2½, as a result of the meeting on Monday, at which the chairman spoke of the probable necessity for shareholders to make some sort of sacrifice if reorganisation of the capital were to take place. Babcock ordinary hardened to 3 5/16. Rubber shares have weakened on the fall in the price of the produce to 2s. 3½d. per lb. The armament group, together with other iron and steel issues, make a firmer market. A striking feature of strength is afforded by the various lists of shares in companies connected with base metals, a sensational rise in the price of tin re-directing attention to Cornish, Malayan, and West African mining shares.

SHARE LIST OF ELECTRICAL COMPANIES.

Home Electricity Companies.

	Dividend 1916.	Dividend 1917.	Price May 7, 1918.	Rise or fall this week.	Yield p.c.
Brompton Ordinary	9	10	89	—	£7 8 0
Charing Cross Ordinary	5	4	81	—	6 8 1
do. do. do. 4½ Pref.	4½	4½	84	—	6 18 6
Chelsea	8	8	98	—	8 6 8
City of London	8	8	13	—	6 10 8
do. do. 6 per cent. Pref.	6	6	99	—	6 0 4
County of London	7	7	103	—	6 13 4
do. 6 per cent. Pref.	6	6	99	—	6 0 4
Kensington Ordinary	6	7	83	—	6 10 3
London Electric	Nil	Nil	1½	—	Nil
do. do. 5 per cent. Pref.	4	5	81	—	8 0 0
Metropolitan	3	4	93	— ½	6 3 1
do. 4½ per cent. Pref.	4½	4½	84	—	6 13 4
St. James' and Pall Mall	8	9	7	—	6 8 4
South London	5	5	93	—	7 2 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	64	—	7 3 10

Telegraphs and Telephones.

	Dividend 1915.	Dividend 1916.			
Anglo-Am. Tel. Pref.	6	6	93½xd	+ ½	6 8 4
do. Def.	83/8	1½	22½	—	8 14 10
Chile Telephone	8	8	78	—	5 8 4
Cuba Sub. Ord.	6	7	10	+ ¼	*7 0 0
Eastern Extension	8	8	15⅝	—	*5 4 1
Eastern Tel. Ord.	8	8	154	—	*5 4 0
Globe Tel. and T. Ord.	7	7	14⅜	—	*4 17 5
do. Pref.	6	6	9¼	—	6 3 1
Great Northern Tel.	22	24	38½	—	6 11 6
Indo-European	13	13	51½	—	6 6 3
Marconi	15	15	3½	—	4 17 10
Oriental Telephone Ord.	10	10	4¼	+ 1/16	3 7 0
United R. Plate Tel.	8	8	7	—	*5 15 4
West India and Pan.	6d.	6d.	1⅛	—	*3 6 8
Western Telegraph	7	8	15⅜	—	*5 4 1

Home Rails.

Central London, Ord. Assented	4	4	63½	—	6 8 0
Metropolitan	1	1	31	+ ½	4 15 3
do. District	Nil	Nil	14	—	Nil
Underground Electric Ordinary	Nil	Nil	1½	—	Nil
do. do. "A"	Nil	Nil	4/8	—	Nil
do. do. Income	6	4	75	+1	*5 6 8

Foreign Trams, &c.

	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	42	— ½	6 6 4
Anglo-Arg. Trams, First Pref.	5½	5½	23	—	—
do. 2nd Pref.	5½	—	23	—	—
do. 5 Deb.	5	5	83	—	7 16 4
Brazil Tractions	4	4	48	+1	—
Bombay Electric Pref.	6	6	94	—	6 6 4
British Columbia Elec. Ry. Pfce.	5	5	83½	+4	8 11 0
do. do. Preferred	Nil	Nil	38½	+6	Nil
do. do. Deferred	Nil	Nil	33	+7½	Nil
do. do. Deb.	4½	4½	63	+6	6 15 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	57½	+1¼	Nil
do. 6 per cent. Bonds	Nil	Nil	80	—	Nil
Mexican Light Common	Nil	Nil	17½	—	Nil
do. Pref.	Nil	Nil	25½	—2½	Nil
do. 1st Bonds	Nil	Nil	86½	—	—

Manufacturing Companies.

Babcock & Wilcox	15	15	3⅝	— 1/16	4 10 8
British Aluminium Ord.	7	10	13⅝	—	6 8 0
British Insulated Ord.	17½	20	83	—	5 10 4
British Westinghouse Pref.	7½	7½	2½	—	6 0 0
Callenders	20	20	17	—	5 17 8
do. 5 Pref.	5	5	4	—	6 5 0
Castner-Kellner	25	20	8½	—	5 14 2
Edison Swan, fully paid	—	—	2½	—	Nil
do. do. 4 per cent. Deb.	4	4	75½	—	5 6 6
Electric Construction	7½	7½	1½	— ¼	6 15 4
Gen. Elec. Pref.	6	6	10½	—	5 15 8
do. Ord.	10	10	20½	—	4 18 9
Henley	25	25	19	—	6 6 7
do. 4½ Pref.	4½	4½	33	—	5 19 2
India-Rubber	10	10	11⅜	—	*3 8 0
Telegraph Con.	20	20	42	—	*5 13 0

* Dividends paid free of income-tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, May 8th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/6	..
a Ammoniac Sal	per ton	£50	..
a Ammonia, Muriate (large crystal)	"	£75	..
a Bisulphide of Carbon	"	..	..
a Borax	"	£43	£5 inc.
a Copper Sulphate	"	£67 10/-	..
a Potash, Chlorate	per lb.	2/6	..
a " Perchlorate	"	2/-	..
a Shellac	per cwt.	£32 10/-	..
a Sulphate of Magnesia	per ton	£15	..
a Sulphur, Sublimed Flowers	"	£35	..
a " Lump	"	£25	..
a Soda, Chlorate	per lb.	1/1	1d. inc.
a " Crystals	per ton	17/-	..
a Sodium Bichromate, casks	per lb.	..	..
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	..	..
c " Tubes (solid drawn)	"	..	..
c " Wire, basis	"	..	..
c Copper Tubes (solid drawn)	"	1/7 to 1/7½	..
g " Bars (best selected)	per ton	£147	..
g " Sheet	"	£147	..
g " Rod	"	£147	..
d " (Electrolytic) Bars	"	£125	..
d " " Sheets	"	£153	..
d " " Wire Rods	"	£128	..
d " " H.C. Wire	per lb.	1/4	..
f Ebonite Rod	"	3/1	1d. inc.
f " Sheet	"	2/6	..
a German Silver Wire	"	2/8	..
h Gutta-percha, fine	"	6/10	..
h India-rubber, Para fine	"	3/2	..
i Iron Pig (Cleveland warrants)	per ton	Nom.	..
l " Wire, galv. No. 8, P.O. qual.	"	£42	..
g Lead, English Pig	"	..	..
g Mercury	per bot.	Nom.	..
e Mica (in original cases) small	per lb.	6d. to 8/-	..
e " " " medium	"	8/6 to 6/-	..
e " " " large	"	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/8½	..
r Steel, Magnet, in bars	per ton	..	..
g Tin, Block (English)	"	..	..
n " Wire, Nos. 1 to 16	per lb.	4/6	3d. inc.

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Valedictory Dinner to Mr. A. H. Seabrook. — On Friday evening, at the Restaurant Frascati, Oxford Street, W., a complimentary dinner to Mr. A. H. Seabrook, M.I.E.E., M.I.Mech.E., general manager of the St. Marylebone electricity undertaking, was given by Mr. Alderman Duncan Watson, and a very enjoyable evening was spent, the Mayor of St. Marylebone, Alderman H. F. New, J.P., presiding. It was expected that Sir John Snell would be present, but he sent a letter expressing regret at being unavoidably prevented from attending. Alderman Duncan Watson proposed the toast of "Mr. Seabrook's Health," and spoke of his good work and friendship during the long term of his association with the undertaking. Mr. Seabrook, in replying to the toast, said it might be thought strange by some that he was leaving the electricity department after being associated with St. Marylebone for so many years, and more especially so as he was leaving a municipal undertaking to join a private firm. The war had caused many changes to be made, however, and as to the future of the generation of electricity, he believed that present methods and customs would have to be entirely altered if we were to compete successfully with countries which possessed water powers. He had for a number of years been interested in the recovery of by-products from coal before it was burned on the grate. The General Electric Co. had recently been placed in a position to acquire the sole rights of a process for the recovery of fuel oil and spirit from coal, and he was joining the G.E.C. in connection with this process. Their policy in the past had been to train up their own men until they were capable of taking up important positions. Owing to the war, however, they had to resort to dilution, and, as a result, he was joining the company.

Alderman Beaumont, chairman of the Electricity Committee, said the St. Marylebone undertaking would feel greatly the loss of its chief engineer and manager, who had done so much good work for it in the past; however, the situation could not be helped, and no doubt the undertaking would be able to continue in the future as it had done in the past. He briefly referred to the difficulties under which the undertaking had been labouring, and said there was a movement on foot for the co-operation of the electrical departments in the whole of the metropolitan area which would, no doubt, result in better conditions for all concerned. Councillor G. B. Brooks also spoke, and Mr. Wilson presented to Mr. Seabrook a handsome silver salver, suitably inscribed, which was subscribed for by the Council. The Mayor, Alderman Duncan Watson, and Councillor Rickatson contributed to the musical part of the programme, which was greatly appreciated.

A BRITISH ELECTRICAL PROVING HOUSE.

By C. TURNBULL, M.I.E.E.

(Abstract of paper read before the Institution of Electrical Engineers.)

This paper, for the title of which the author is indebted to Mr. C. H. Wordingham, President of the Institution, deals with a proposal to provide a proving house to meet the requirements of the British electrical industry, for the purpose of testing electrical accessories, wiring materials, &c., although its work would doubtless extend to other directions as the necessity arose. One may compare its operation with that of Lloyd's Register, which has done such remarkable work for the shipping industry. Local laboratories have been in existence in Manchester and Glasgow, and possibly other towns, for many years past, and their work has been beneficial to the districts concerned. Establishments on a larger scale are also at work in some other countries with good results.

In this country the Engineering Standards Committee has produced a number of excellent specifications which have prepared the way for work of a more advanced nature. One may also mention the very useful work done by the Cable Makers' Association. Before the introduction of the C.M.A. cable specifications it was customary for every consultant to specify for cables based on his own experience, with the result that there was an unnecessary diversity in the types passing through the factories. The C.M.A. specifications were immediately accepted by the industry, and their use has caused a great saving to both buyers and manufacturers. The Institution Wiring Rules have resulted in a further simplification in wiring work, as practically all authorities throughout the land now accept them as their standard. In these cases the work has gone no further than the issuing of specifications and rules, and no laboratory has been established for testing apparatus and material to see if the same conforms to requirements.

It is not enough merely to print rules relating to installation work; no matter how much care may be taken in their wording, from time to time it will happen that doubt will arise as to their meaning. A difficulty also arises in specifying materials for installations. It is common practice for consultants to specify the actual makers of the apparatus and materials to be used, and from many points of view the plan has merit. But the plan has its disadvantages. Prices may be increased where suppliers know that their goods are specified, while less-known firms may have difficulty in getting their things on the market.

The best solution of the difficulty would be for the electrical industry to found and maintain a proving house to test samples of standard apparatus and materials, and to give certificates where the same had passed the tests imposed. Consultants would merely specify the class to which the materials should conform, and it would no longer be necessary to mention the manufacturer's names. The use of various classes would result in economy in many instances; it might eventually be found that much cheaper material would be satisfactory for the ordinary installation than are now considered desirable. We have had an example of this in the case of the higher densities now allowed for small sizes of rubber-covered wires, the increased carrying capacities having been discovered as soon as scientific methods were brought to bear on the problem.

The proving house would enable contractors to buy their materials on the best terms, with the certainty that there would be no difficulty in getting them accepted by buyers. Manufacturers would also be able to guarantee their goods, as they would know exactly what tests would be enforced. Buyers would soon demand that only certified goods must be supplied to them in all cases; this would tend to eliminate unsatisfactory apparatus and materials of every kind.

It is suggested that the proving house should be organised on commercial lines, its aim being to assist British trade. Its certificates would give a hall-mark to those British firms who were able to satisfy its requirements, and this would create a prestige for British manufacturers which would be useful not only at home, but in foreign markets. The value of such prestige is incalculable; an enormous amount of business comes from foreign markets to firms who have been able to create the feeling that their goods are the real thing, and once this feeling has been created it is difficult for competitors to get in at all.

The board of control might consist of representatives drawn from all interests concerned, including Government departments, consulting engineers, manufacturers, electric supply undertakings, insurance companies, and users of electrical goods. The laboratory work would be carried out by a highly trained staff provided with the necessary equipment. The control committee would keep the proving house in touch with modern ideas, and see that it did not get out of date.

The duties of the proving house might be on the following lines:—

1. It would assist the Engineering Standards Committee in the preparation of specifications for electrical accessories and apparatus, with details of tests which they were to undergo.
2. In conjunction with the appropriate committee, it would assist in drawing up new and improved rules from time to time.
3. It would test samples from manufacturers, and certify those which were satisfactory.
4. It would test actual samples taken from installations, and decide whether the same came up to specification or not.
5. It would keep in touch with breakdowns and failure of materials and accessories, with a view to the elimination of those which were defective.
6. It would publish results obtained in a form useful to the manufacturer and user of electrical apparatus.

It is suggested that the proving house should begin its work by taking up the testing of selected electrical accessories, such as rubber-covered cables as used for ordinary installations, switches, fuses, plugs, starters, and similar things, other items being added as found desirable.

The testing of rubber-covered cables is admittedly a difficult subject, but, from past experience, we may be certain that efficient methods will be discovered when expert investigators tackle the problem with the aid of a properly equipped laboratory. It is impossible to frame rules which debar inferior cables, unless recognised tests are introduced by which the bad may be discriminated. Before the war very large quantities of cheap German cable were introduced into this country, and much of this was known to have a short life. Some of the flexible wire now sold is of unsatisfactory quality, and means should be taken to remove it from the market.

From time to time makers introduce new types of cable, some of which are of great value, while others are not. The question arises: How can wiring rules committees deal with such new types? Take, for instance, cables protected with tough rubber compound. These are permitted, without casing or conduit, by Clause 65 of the Institution Wiring Rules subject to their conforming to certain conditions, yet it would doubtless be possible to make a cable, of which a new sample would fill all requirements of the Wiring Rules, although such cable might not be reliable over a long period of time.

The tests undertaken by the proving house would ultimately ensure that only suitable materials came on to the market.

Many inferior lampholders have been imported into this country, and have had a ready sale owing to their low prices. The ordinary cord-grip fitted to lampholders cannot be depended on for gripping the flexible cable, but even when it does so, it nips the cable in such a way that the latter is liable to break off just above the grip. Lampholders are often not made to gauge, so that they do not fit lamp tops properly. The proving house could do useful work in eliminating poor designs and patterns of holders.

Many details in the manufacture of lamps have given trouble, although, on the whole, British lamps are satisfactory. Caps sometimes come loose owing to defective cement, and the leading-in wires occasionally short-circuit. Half-watt lamps taking 150 and 200 watts have Edison screw caps, while lamps of 300 watts and over have Goliath caps. At 220 volts the current of the 150-watt lamps is about ¾ ampere, and for the 200-watt lamp it is still under an ampere. Lamps at these currents have run satisfactorily from ordinary bayonet-cap lampholders for many years past, and it seems to be an unnecessary inconvenience to make them with the Edison cap now.

Much useful work could be done by the proving house in getting information as to the economical life of metal lamps. In this country they are usually much underrun, whereas on some parts of the Continent the lamps are overrun. It is probable that it would pay users here to run their lamps at a higher efficiency.

The use of efficient reflectors, instead of dense shades, has made a marked improvement in illumination during recent years. Yet the old vicious type of shade is still used far more than it ought to be. The proving house could assist in the direction of reform.

Many tumbler switches listed for 5 and 10 amperes at 240 volts are unable to deal with anything like the full load. Many double-pole switches in cast-iron cases are quite unsuitable for breaking their rated loads frequently, particularly if the circuit be at all inductive. The general design is often defective. Switches for electric ovens, radiators, &c., are often unsatisfactory, as their capacity for breaking current is insufficient. There is an opening in this direction for much useful work, so that defective designs might be superseded.

There is much need of experimental work to determine which types of insulation are reliable. Slate is still used for switchboards, but it is liable to faulty insulation. Many of the artificial insulators are also defective. Insulation for radiators and ovens particularly requires investigation, both as to the actual properties of the materials and as to the design. The whole subject of insulation would give profitable employment to a large department of the proving house.

Many of the fuses in use are far from satisfactory. A favourite design for house distribution-boxes has the fuse on the top of the bridge. This exposes an unwary operator to the danger of severe burns should the fuse blow when it is being replaced. Fuses should be arranged so that they will be reasonably safe if they are inserted on a short-circuit. Many fuse bridges are weak, and are liable to fracture every time a fuse blows on a heavy overload. Clips also often break off after they have been in use for some years. One may ask here why makers still maintain the habit of supplying distribution boards with glass fronts. A wooden door would be far better.

Certain types of enclosed fuses for a time had a great sale, but experience did not bear out the claims of certain patterns. A proving house would be very useful in preventing such unsuitable apparatus from getting into general use.

The proving house could do useful work in ensuring that plugs conformed to the design of the Engineering Standards Committee. The present needless diversity in designs is a perpetual source of irritation.

The question will be asked: How is the cost of the proving house to be met? Our Allies in the United States pay the expenses out of the profits which accrue from research work, and have something over besides. There should be no difficulty in arranging a levy on an equitable basis, while in addition there would be a revenue from fees for testing apparatus. The U.S.A. laboratories obtain hundreds of thousands per annum for research work, and one may expect that British firms would be no less enterprising, once they had come to understand the benefits of the work.

It is evident that some legislation is required to put the wiring and accessories business in a proper position. For instance, it ought to be an indictable offence for anyone to fix a heavy shade in the roof of a public building, suspended on a weak lampholder by a piece of thin,inferior flexible cable, with no proper means of taking the weight. It ought also to be an offence for anyone to wire houses with cable the insulation of which may be expected to perish in a short time. But it is evident that Parliament cannot pass the legislation required until a recognised authority is constituted which can be relied upon to give correct verdicts on matters submitted to it. Lloyd's Register, for instance, receives recognition by the authorities because it has proved itself capable, and the British Electrical Proving House would also receive similar recognition when it had become the accepted authority of the industry.

Mr. A. P. M. Fleming's book on "Industrial Research in U.S.A." shows that many private firms in U.S.A. spend as much as £100,000 per annum in research work, and their enthusiasm for it is continually growing. England's neglect of science has become almost a proverb, with results which the war has brought out very clearly. During the present century we have not utilised the engineering ability of our people to the fullest extent. The establishment of the proving house would introduce a new era in many directions. When its experts declared that apparatus was not fulfilling its functions properly, the manufacturer would not be slow to make the required changes. The proving house would further provide scope for the trained experimenter, and act as a training centre from which manufacturers would be able to get a supply of trained men to carry on private work. The extension of private laboratories in our works is greatly needed. Once they are able to obtain trained men, we may be sure that manufacturers will not be slow to avail themselves of the opportunity for extending the scope of their operations in the coming world struggle for industrial supremacy.

THE CONTROL OF LARGE AMOUNTS OF POWER.

DISCUSSION AT GLASGOW.

MR. E. B. WEDMORE read his paper on April 9th before the SCOTTISH LOCAL SECTION of the INSTITUTION OF ELECTRICAL ENGINEERS.

Mr. J. K. STOTHERT suggested the adoption of more than one power station in certain large districts, and said he was glad the author agreed as to the advisability of placing the reactance in the generator itself, rather than have it externally. An interesting statement was made by Mr. Wedmore about the minimising of a fault due to a cracked insulator if the insulator was mounted in brick or stone with the supporting walls reinforced. The author said that the first indication of a fault to earth was the occurrence of a dead short circuit to earth. This was not in accordance with the speaker's experience. He had one fault in view where the cable was switched out of circuit before the lead on the earth side was damaged on a 600-volt circuit. As to the rupturing capacity of oil switches, Mr. Lackie considered that there was justification in asking for much stronger tanks to contain the oil surrounding the switches. There had been numerous instances of the tanks bursting as a result of shock when the switch was opened on considerable overload. The rupturing capacity of a switch was rather a vague term. It was stated that there were on the market to-day switches capable of rupturing 750,000 KW. In connection with Mr. Wedmore's recommendation that oil switches be used for all normal switches, and the air-break switches only used for isolating parts already made dead by oil switches, there was switchgear on the market which did without the necessity of isolating switches. He referred to the "carriage" type of switch, of which Messrs. Reyrolle were the pioneers, and for the Dalmarnock works he had adopted an oil-immersed isolating switch. His endeavour there was to enclose the conductors throughout their entire length from machine to consumer in insulating material protected by lead or iron, and the bus-bars would be run up solid. The recent addition to isolating switches, viz., the locking-in device, was not quite necessary, and the earthing of the neutral point of a three-phase generator through a thick resistance was becoming very cumbersome and costly.

Mr. NORMAN C. BRIDGE expressed the opinion that in future developments, generally speaking, the model station would have to deal with one or both of two distinct sets of conditions. One type of station would deal with large demands concentrated within a limited radius, and would distribute at the generator voltage, say, 6,000 or 10,000 volts. The distribution system would be consolidated by interlinking the feeders, so that if the bus-bars were sectionalised through reactances the feeders would also require reactance. The other type of station would deal with a number of more remote centres of demand, and would distribute to these at 20,000 or 30,000 volts. The only interlinking in this case would be at the far end of each set of transmission lines through reactance between sections of the sub-station bus-bars. When dealing with outputs in the nature of 100,000 K.V.A., it might be advantageous in some cases to erect a distributing and a transmitting station on a single site with eight similar generators, but with two switch houses. These would be paralleled through transformers to get interchange of power within reasonable limits. Should the whole output of the double station be required at a common voltage, the two switch houses would be paralleled through reactances. If developments could be guided on these general lines and a moderate short-circuit factor agreed upon, then the problems of proportioning impedance seemed to be fairly simple. With two bus-bar sections only in any one switch house no question arose as to the relative merits of star and ring arrangements of bus-bar reactance, and when it came to two coupled switch houses *a closed ring was obtainable without utilising the auxiliary bars.* This eliminated the principal objection to the usual ring arrangement. He suggested that the oil switch in series with bus-bar reactance was unnecessary unless the isolation of the section was a frequent requirement. With an isolator on each side of the reactance it could be withdrawn or inserted at any time when the short-circuiting oil switch was closed. As to phase faults, there were two weak points in most of the existing systems—cable joints and sub-station switches. If cable joints were made with an earthed shield between phases, and if all single-tank, three-pole oil switches working at the main voltage were replaced by single-pole switches with barriers, as in the power station, the chances of phase faults outside the station should be considerably reduced.

Mr. R. B. MITCHELL said that in a number of supply stations at present, especially when new stations were being built, higher voltages—20,000 or 30,000—were being adopted to feed the existing lower-voltage system through step-down transformers. The question arose whether the two voltages should be perpetuated or whether preparation should be made for gradual elimination of the lower-voltage supply. The double transformation was admittedly a disadvantage, and for the sake of simplicity it might be well to adopt only the higher voltage throughout. Also, the cheapening of the outfit required for the smaller consumers might be brought about by the introduction of a satisfactory 20,000- or 30,000-volt fuse, which might be installed in these cases at a very much smaller cost than was necessary at present.

Mr. F. H. WHYSALL said that on feeders where consumers possessed switchgear which could not readily be altered or replaced, and which, owing to changed conditions, might be subjected to serious strain, it would be advisable to put in reactances.

Mr. MACLEOD considered that two spares of the larger-sized units were not justified. He did not see why on machines stepping up to 20,000- or 30,000 volts the switch should not be carried on the low-pressure side. He agreed as to overhead transmission for smaller amounts of power, but not for super-stations, owing to the liability of tampering.

Mr. HIRD agreed with the author's views in favour of the use of reactance.

Mr. J. R. COWIE held that the combination of switchgear with reactance was necessary, though some of the author's suggestions seemed to advocate reactance as a means of employing altogether inadequate switchgear. A new line of business was being started in the adoption of super-power stations, and Continental and American practice and information was at one's disposal. The disturbances on these systems due to switches and reactances failing under short-circuit conditions were well known, and generally resulted in rebuilding the switch and reactances. Switch failures, such as these, would not be tolerated by consumers and British engineers in this country.

Mr. E. B. WEDMORE said he would reply fully through the *Journal*.

Standardisation of Motor Shafts.—Particulars are given in the *Revue Générale de l'Electricité* of April 13th of the standards adopted by French manufacturers of electric motors for the ends of the spindles—a matter of great importance in view of the extended use of electric power. Two standard types are specified, one cylindrical the other taper, with a nut and washer, a sunk key being provided in each case. The shaft diameters listed range from 10 to 200 mm. in 27 sizes.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

ANNUAL MEETING.

The annual general meeting of this Institution was held at the offices of the British Electrical and Allied Manufacturers' Association, King's House, London, on Monday, April 29th. Mr. C. E. Hunter was in the chair. After the report of the Committee for the year 1917 had been read, the chairman (Mr. C. E. Hunter) moved the adoption of the report and accounts. He said that the meeting was held at the B.E.A.M.A. offices, as it was desirable while the offices of the I.E.E. were not available to hold the annual meetings under the auspices of different electrical trade associations. The total contributions for 1917 were £782, compared with £609 in in 1916. Although an improvement, the amount was very small, chiefly because the annual festival had not been held. He was prepared, if it was the wish of the meeting, to make a chairman's appeal this year. The subscriptions were £251, compared with £270, the fall being due chiefly to many of the members being on Active Service. The total dividends amounted to £383, as compared with £327. The total cost of working the Institution was £159, as compared with £184. For the second year in succession it had been reduced, but it was doubtful whether it could be brought below the present figure. As the first object of the Institution was to build up a fund out of the dividends on which pensions could be paid to the members, the fact that £995 had been carried to the credit of the balance sheet must be viewed as a very satisfactory result. The secondary object of the Institution was to give temporary relief to qualified destitute persons. The present condition of the labour market was such that only in one case during the last year had it been necessary to give financial assistance, and in this case the total was £10. They continued to carry out the policy that to find work was a better means of helping than to give financial aid; every qualified person who applied for assistance had received it. In 1916 the Institution had a holding in 4½ per cent. War Stock and also in 5 per cent. Exchequer Bonds. This holding was converted into 5 per cent. War Stock and a further £947 had been invested in 5 per cent. War Stock, bringing the total holding in this security to £2,000, the total cost of which holding was £1,879. The total amount invested at cost price was £9,606. Mr. Campbell Swinton, the chairman of the last annual general meeting, gave a donation of £100, in the hope that by setting this example the invested funds would reach the figure of £10,000 in 1917. The Committee regretted that this stepping-stone had not been reached. Mr. Hunter was willing to follow that example, and would give a hundred guineas to the Institution, in the hope that his example might be followed by others, and thus bring the invested funds not to £10,000 but to £20,000. The Committee were extremely desirous of increasing the number of persons collecting, and asked for every possible publicity to be given to this matter, in order that the heads and the members of the staffs of firms should appoint collectors. Considerable energy had been constantly shown in Cardiff by Mr. Hobbs in supporting the Institution and obtaining new members, and a concert, organised by him in the early part of this year, had produced most satisfactory results. This good example had been followed in the Bristol area, and there the energy of Mr. Fifield was sure to produce good results in the future.

In seconding the resolution Mr. Rawlings expressed himself entirely in agreement with the suggestion made by the chairman, that an appeal should be sent out by Mr. Hunter this year. He raised the point that what seemed to be lacking in the Institution was its ability to reach the rank and file, and he hoped that from Mr. Hunter's fertile brain there would issue some suggestion that would enable the Institution to do so. They must be made to feel that they were joining an Association of which they were actual members, and not merely subscribers to a fund to help their "poor relations."

Mr. Percy Rosling, in supporting the motion, approved of Mr. Rawlings's suggestion respecting the rank and file.

Mr. Law mentioned that the Electrical Power Engineers' Association were now taking a very active interest in the Institution.

The report and accounts were unanimously adopted.

The following were re-elected members of the Committee of Management:—H. H. Berry, H. Bevis, E. J. Clarke, Lord Vaux of Harrowden, R. J. Wallis-Jones, and S. D. White.

Messrs. F. W. Fifield, W. E. Hobbs, and G. C. Law were elected members of the Committee, the secretary pointing out that the presence of Mr. Fifield and Mr. Hobbs on the Committee would largely influence the successful working of the new Local Advisory Committees which the Committee had decided to form in Bristol and Cardiff. Mr. Law represented the Electrical Power Engineers' Association.

A vote of thanks to the B.E.A.M.A. for the use of its offices was passed, as was also one to Mr. Hunter, the chairman (on the motion of Mr. Justus Eck).

The chairman, in acknowledging, expressed the hope that the Local Advisory Committees would do much to bring in the rank and file.

Patent Application.—Dr. J. A. Fleming and Marconi's Wireless Telegraph Co., Ltd., are petitioning for an extension of term in respect of Patent No. 24,850 of 1904, granted to the former

THE ELECTRIC PROPULSION OF SHIPS.*

In the course of a paper by Eskil Berg read at a joint meeting of the Electrical Section of the Franklin Institute and the Philadelphia Section, American Institute of Electrical Engineers, a description is given of the new U.S. battleship *New Mexico*, which is now under construction at the New York Navy Yard. This installation provides conditions where the advantages of electric propulsion can be realised. The *New Mexico* is the largest and most powerful battleship which has been laid down by the U.S. Navy up to the present time. She will have a displacement of 32,000 tons, and a designed speed of 21 knots, requiring about 28,000 H.P. The propelling machinery is, however, designed to deliver a maximum of 37,000 H.P., and it is believed that this will give her a speed of 22 knots.

The equipment will consist of two turbo-generating units, four propelling motors (one for each shaft), switching apparatus, cables, instruments, &c. The contract also calls for two 300-KW., non-condensing, direct-current turbo-generators, which will furnish excitation and power to drive the auxiliary machinery. As the General Electric Co. was required to guarantee the steam consumption of the propelling machinery, including the auxiliaries, the greatest care was taken in their selection, and they are all to be electrically driven. The exhaust steam from the direct-current generating sets which operate non-condensing will be used for heating the feed water, and any that may not be required for this purpose will be exhausted into the main turbine. The generators for the *New Mexico* are bi-polar alternators, and the motors are arranged to be connected for either 24 or 36 poles. For economic cruising at a speed of 15 knots or less, only one generating unit will be required with the motors on the 36-pole connection. For higher speeds the 24-pole motor connection will be used with both generators. One generator, however, will be capable of driving the ship up to a speed of about 19 knots.

Speed variations with either motor connection will be obtained by varying the generator speed, and a governor will be installed similar to that used with the *Jupiter* † equipment.

The steam consumption guarantees as made to the Government cover the total amount of steam used both by the main generating units and the auxiliaries, and are as follows:—

STEAM PRESSURE 250 LB. GAUGE AT THROTTLE.

10 knots	...	...	...	14·6 lb. per shaft	H.P.-hour.	
15 knots	...	...	...	11·4	"	"
19 knots	...	...	...	11·1	"	"
Max. speed	...	...	...	11·9	"	"

Very heavy penalties are attached to these guarantees in case they are not met, namely, $25,000 per lb. for the two lower speeds, and $20,000 per lb. for the two higher speeds.

At full speed the *New Mexico's* propellers will operate at 175 revs. per minute, the lowest speed permissible within the space allowed. The propeller speed for the sister ship of the *New Mexico* with geared turbines is 240 revs. per minute, which, according to Capt. Dyson, would indicate a propeller efficiency 9 per cent. worse than is expected on the *New Mexico*, and this difference would more than compensate for the electrical losses in the motors and generators.

In order to be able correctly to judge the relative economy of different methods of propulsion, it may be interesting to compare the water rate per effective H.P., taking for examples of such different methods the battleships *Florida* and *Utah*, which are equipped with geared turbines; the *Delaware*, which has reciprocating engines, and the *New Mexico*, with electric drive:

	Propeller speed.	Water rate per effective H.P. per hour. 12 knots.	19 knots.	21 knots.
Florida	328	31·8	24·0	23·0
Utah	323	28·7	20·3	21·0
Delaware	122	22·0	18·7	21·0
New Mexico	175	17·3	15·0	16·4

The guaranteed weight of the propelling machinery for the *New Mexico* without the auxiliaries is 530 tons, with a penalty of $500 per ton for any excess over this amount. The estimated weight of the geared turbine equipment for this vessel was 653 tons.

The contract price for the *New Mexico* machinery was $431,000, and the Navy Yard estimates show that a saving of $200,000 will be effected by using this equipment instead of the equipment originally contemplated.

BRITISH MANUFACTURERS IN AUSTRALIA.

The annual meeting of the Australian Association of British Manufacturers and their representatives was held at Melbourne on February 21st. Mr. Matthew C. Coates, the president, said that the membership had increased during the past 12 months by leaps and bounds—namely, by 148 to 478. He urged members to approach their principals with a view to getting them to join the Association.

In reviewing the work undertaken during the year, he referred to the question of London representation, Federal income-tax, assessment of duty on home consumption value, Customs decisions, certificate as to home consumption value, insurance, trade after the war, &c., dealt with in the annual report. Mr. G. T. Milne, H.M.

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* *Journal* of the Franklin Institute, Vol. 185, No. 3.

† See ELECTRICAL REVIEW, Vol. 71, October 18th, and September 20th, 1912.

Trade Commissioner, was a guest at the meeting, and the president mentioned that the relations of the Association with him had been on the most cordial terms. As he was shortly leaving to take up important work in Canada, it was the intention of the Council to arrange a farewell gathering in his honour.

Mr. Coates quoted the following figures of imports into Australia during the years 1912-13 and 1916-17 as an indication of the direction in which business was flowing :—

	1912-13.	1916-17.
United Kingdom	... £47,600,000	£40,000,000
United States...	... 9,500,000	15,000,000
Japan	... 900,000	3,400,000

These figures had to be considered, of course, in their relation to enhanced prices, and, therefore, the true position in regard to the drop in the volume of imports from the United Kingdom was even greater than that shown above, as the 1916-17 figures included the increased cost of production, due to the war.

American and Japanese figures did not carry nearly the same percentage of increase. Certain industries in Australia were suffering from lack of raw material, the export of which had been restricted by the Imperial Authorities, owing to the pre-occupation of British manufacturers in war activities ; but certain manufacturers had at times had material ready in their works for shipment, but were unable to ship owing to having no priority certificates or shipping permits. It was understood that the British Ministry of Munitions had established a system of issuing rationed permits for certain material to manufacturers, and the purchase of goods manufactured from such rationed material could now be made without priority certificates. This rationing scheme would in some measure help them to regain business in Australia, which had of late been going elsewhere.

The British Ministry of Munitions had also established Advisory Committees to work in conjunction with the Department, and it was felt that the adoption of a similar procedure in connection with the office of the Australian Directorate of Munitions would generally have a beneficial effect upon trade. Mr. Coates referred to the activities now taking place in Great Britain towards the expansion of trade, and the methods to be adopted to afford greater facilities to British manufacturers and producers. All these happenings were indications that in Great Britain, and in every Dominion and Colony there were signs of alertness and firmer determination to organise trade and to co-operate through industrial associations, in order to maintain and increase the prestige of British trade after the war. Great activities had taken place with the object of placing British industries foremost in the world's markets, and establishing them throughout the Empire, and this Association would have a large part to play in these activities, as the ambassadors of commerce representing those British industries, and to consider the best means of linking up with the movements. They had already taken the first step in the appointment of Mr. Summers (late of the Commercial Intelligence Branch of the British Board of Trade) as their London representative.

Pending the advent of peace, they must meet and discuss the problem of trade after the war in all its bearings, and, if possible, be prepared to face the future. The conditions of the nation's life, and of industry, were constantly changing, and they were faced with problems arising, some slowly and some abruptly, for which there was no precedent, problems which, in any case, could not fail to be charged with momentous issues for their industry, and, perhaps, for their Association.

They must work to protect the interests of their principals who, through their efforts to win the war, were unable at the present moment to cater fully for the Australian market, and, where possible, they must urge for that measure of consideration and preference for the products of the Mother Country, to which she was entitled.

Mr. G. T. Milne, H.M. Trade Commissioner, said that there never was a time when close co-operation between the factors of production and distribution was more necessary than now, both in Great Britain and in Australia.

Mr. T. W. Heath, representing the Sydney Council of the Association, voiced a complaint that many business men in Australia were sending registered designs of British goods to Japan, where they were being copied, and placed on the Australian market in competition with the products of British manufacturers.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford

6,748. "Instrument for tapping into field telegraph, &c., cables." A. MacArtair. April 22nd.

6,750. "Portable electric lamps." H. Rottenburg. April 22nd.

6,761. "Electric motors." British Thomson-Houston Co. (General Electric Co., U.S.A.) April 22nd.

6,762. "Electromagnetic switches." British Thomson-Houston Co. and H. C. Hastings. April 22nd.

6,767. "Electric lampholders and cord grips." C. G. Bennett & H. Garde. April 22nd.

6,781. "Electric switchgear." H. W. Clothier & A. Reyrolle & Co. April 22nd.

6,785. "Electric time switches." M. A. Abrahamson, L. Christiansen and H. E. Tvermoes. April 22nd

6,795. "Current-regulating devices for dynamos running at variable speed." Officine Elettro-Meccaniche. April 22nd.

6,811. "Electric testing apparatus." J. MacFadden. April 23rd.

6,816. "Isolating faults on electrical transmissions." A. G. Collins and Crompton & Co. April 23rd.

6,817. "Protective apparatus on alternating-current system." A. G. Collins and Crompton & Co. April 23rd.

6,829. "Sparking plugs for explosion motors." J. F. Edanois. April 23rd.

6,840. "Circuit interrupters for electric ignition of internal-combustion engines." E. Marelli & Co. April 23rd. (Italy, April 27th, 1917.)

6,856. "High-tension transformers." F. Dessauer. April 23rd.

6,896. "Ferraris relay for protection of multiphase motors, &c." R. J. Jensen. April 24th. (Denmark, April 24th, 1917.)

6,910. "Vents for electric accumulators and batteries." Lithanode, Ltd., and H. Ramsbottom. April 24th.

6,914. "Apparatus for detecting variation in a magnetic field." D. K. Morris & J. W. Roebuck. April 24th.

6,918. "Electric starters for internal-combustion engines." A. H. Midgley and Vandervell & Co. April 24th.

6,931. "Self-starting devices for internal-combustion engines." F. L. Rapson. April 24th.

6,933. "Terminals for magneto-electric machines, &c." A. M. Allen and R. B. North. April 24th.

6,978. "Telephonic systems." E. A. Graham & W. J. Rickets. April 25th.

6,981. "Electric starter for internal-combustion engines." Officine Elettro-Meccaniche & G. Questa. April 25th.

6,988. "Electric lamp fixtures." S. W. Farber. April 25th.

6,991. "Apparatus for eliminating interference in wireless telegraphy." Marconi's Wireless Telegraph Co. & H. Richmond. April 25th.

7,006. "Coin-freed telephone call-boxes." Ges. fur Elektrische Industrie. April 25th. (Austria, May 25th, 1914.)

7,008. "Electric ignition devices for internal-combustion engines." W. O. Kennington. April 25th.

7,011. "Coin-freed telephone call-boxes." Ges. fur Elektrische Industrie. April 25th. (Austria, March 19th, 1917.)

7,022. "Apparatus for magnetic galvanic treatment of the human body." J. Krauer. April 26th.

7,037. "Apparatus for reproducing in ordinary characters messages received as electric impulses or as perforations in tape." F. G. Creed, Creed and Co., & A. J. Polley. April 26th.

7,047. "Electric induction apparatus." British Thomson-Houston Co. (General Electric Co., U.S.A.) April 26th.

7,052. "Variable electric resistance." Sir W. G. Armstrong, Whitworth and Co., W. E. Dalby and J. S. Wilson. April 26th.

7,074. "Electro-deposition of iron." Brazil, Straker & Co. and F. A. Shepherd. April 26th.

7,083. "Audion or lamp relay or amplifying apparatus." M. Latour. April 26th. (April 30th, 1917.)

7,092. "Thermo-electrically-controlled valves." G. Wilkinson. April 27th.

7,129. "Portable electric batteries." Accumulators, Ltd., & A. Hunter. April 27th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

15,975. Electric Cooking Stoves. F. P. Fletcher. May 7th, 1917. (114,437.)

16,800. Ohmmeter. B. P. Romain. November 23rd, 1916. (114,438.)

16,801. Electric Capacity Meter. B. P. Romain. November 23rd, 1916. (114,439.)

1917.

153. Electromagnetic Switches. Electric & Ordnance Accessories Co., Ltd. January 3rd, 1917. (114,445.)

2,865. Electric Water-heater. E. C. Webster. February 27th, 1917. (114,448.)

3,061. Lifting Magnets. A. H. Curtis & Igranic Electric Co. March 1st, 1917. (114,451.)

3,253. Electric Heating Elements. L. G. Caunter. September 5th, 1917. (114,452.)

4,493. Magneto of the Type Comprising a Rotating Shield. Soc. des Moteurs Salmson. May 10th, 1916. (106,475.)

4,701. Incandescent Electric Lamps. F. Harrison & J. J. Russell. March 31st, 1917. (114,464.)

4,758. Telegraph Systems. J. A. L. Dearlove, A. Davidson & N. J. Perryman. April 2nd, 1917. (114,467.)

4,886. Manufacture of Electric Storage Battery Plates and the Paste therefor. H. Wade (L. H. Flanders). April 4th, 1917. (114,475.)

4,993. Demagnetiser for Continuous or Alternating Currents. A. Hollingworth. April 10th, 1917. (114,483.)

5,196. Reversing Devices for Internal-combustion Engines provided with Electrical Ignition. A. G. Hallberg. April 12th, 1917. (114,489.)

5,220. Electric Welding. W. H. Walker. April 14th, 1916. (105,572.)

5,414. Telegraph Systems. J. A. L. Dearlove, A. Davidson & N. J. Perryman. April 17th, 1917. (114,495.)

8,937. Electrically-driven Road Vehicles. L. la Roche. June 21st, 1917. (114,537.)

9,287. Wireless Signalling Systems. British Thomson-Houston Co. (General Electric Co., U.S.A.) June 28th, 1917. (114,539.)

9,308. Electrical Condensers for High-tension and High-frequency Currents. A. Kowalski. April 13th, 1917. (Addition to 9,111/17.) (114,540.)

9,959. Electrical Coils, and Methods of Winding same. H. Wade (Universal Winding Co.). July 10th, 1917. (114,546.)

10,213. Ventilation and Cooling of Dynamo-electric Machines. C. W. Major. July 14th, 1917. (114,549.)

12,412. Trolley Wheels or Collectors for Electricity. A. E. Alexander (Ollard Trolley Wheel Co., U.S.A.). August 29th, 1917. (114,571.)

13,309. Control System for Two Electric Motors operating a Number of Shafts. G. Paratore. October 9th, 1916. (112,008.)

13,726. Device for Overhead Electric Trolley Wires. P. Dawson, F. W. Dawdry & H. W. H. Richards. September 24th, 1917 . (114,578.)

14,033. Electric Couplings. H. de la Valette. November 3rd, 1916. (110,908.)

15,883. Shade Supports for Gas Burners and Electric Lights. F. J. Gould & E. S. Stamp. October 31st, 1917. (114,586.)

16,267. Magneto-electric Machines. British Thomson-Houston Co. & A. P. Young. November 7th, 1917. (114,588.)

1918.

1,073. Electromagnetic Relays. M. B. Richter. January 18th, 1918. (114,606.)